Niles Eldredge

CANADA
DEPARTMENT OF MINES
HON. CHARLES STEWART, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER

GEOLOGICAL SURVEY
W. H. COLLINS, DIRECTOR

MEMOIR 137

No. 118, GEOLOGICAL SERIES

Palæontology of the Silurian Rocks of Arisaig, Nova Scotia

BY
F. H. McLearn

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1924

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Palæontology of the Silurian Rocks of Arisaig, Nova Scotia

PART I

GEOLOGY AND FAUNAL RELATIONS

INTRODUCTION

Arisaig is a small fishing village on the northeast coast of Nova Scotia, about 17 miles from Antigonish, a town on the Canadian National railway. Northeast and southwest of Arisaig the Silurian terrains extend along the shore of Northumberland strait from Malignant cove to McAras brook (Figure 1). The Silurian has been the subject of a number of investigations in recent years, made through the interest of Professor Charles Schuchert, of Yale University. In July, 1900, Professor Schuchert paid a first visit to Arisaig. In 1909 W. H. Twenhofel studied the section in detail and obtained a large collection of the fossils for Yale University. As a detailed description of the lithological and faunal succession, Twenhofel's published work leaves little to be desired, except that the range of many undescribed species could not be given. Schuchert added a note on correlation to Twenhofel's paper. Later M. Y. Williams made an elaborate study of the geology of the Arisaig area; he completed the establishment of the major zonal arrangement, but left the purely palæontological problems unsolved.

Professor Schuchert then proposed that the writer take up the systematic study of the faunas and an arrangement was made whereby the work was to be done at Yale University under the direction of Professor Schuchert and the results published by the Geological Survey, Canada. In the spring of 1914 the writer visited Arisaig in company with Professor Schuchert, and remaining alone, spent nearly four weeks in going over the sections. Collections of fossils were made and, in particular, a new Beechhill outcrop on Rory McDonald brook was found, the fossils from which have added much to the Beechhill fauna.

The Arisaig locality was chosen for study because the Silurian faunas are better preserved there than elsewhere in Nova Scotia. The strata exposed there constitute a large part of the whole Silurian system and the fossils found in them include a preponderating share of all the known fossils in the Silurian of Nova Scotia. Arisaig is, therefore, the key locality for the Silurian of Nova Scotia. No complete work on the Silurian palæontology of the province has ever been prepared and most of the former papers relating to the subject are out of print. Indeed, many of the species discovered were never described in print and a considerable number of the described species were not illustrated. In these circumstances the present report upon the palæontology of Arisaig has been made as com-

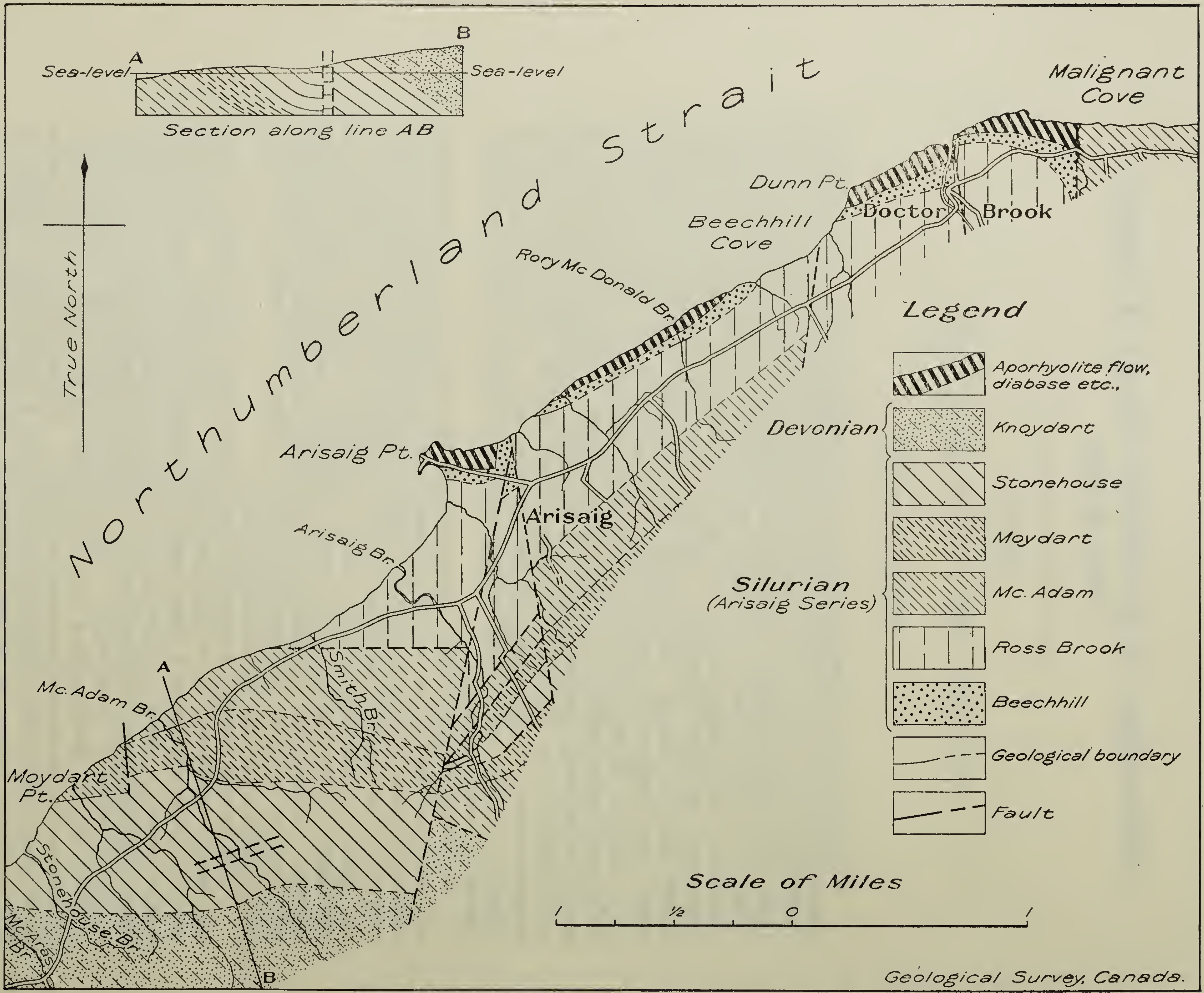

Figure 1. Index map showing general structure and distribution of formations in Arisaig district, N.S. (From Geological Survey Map 137A by M. Y. Williams, with modifications by F. H. McLearn.)

plete as possible and illustrated fully in order that it may serve as a work of reference on the Silurian palæontology of Nova Scotia, both for the guidance of geologists in the field and for the use of students in the colleges of the province.

As the refinement and value of palæontological correlation depend on the kind of organisms used, it is important to note that the conclusions herein reached are based primarily on Brachiopoda and Pelecypoda, to some extent on Trilobita, and subordinately on Graptolitoidea and Gastropoda. The evidence of Bryozoa and of Ostracoda is not used.

Over 300 lots of fossils have been examined. The most important collection is one made for Peabody Museum, of Yale University, by W. H. Twenhofel; it consists of more than 200 lots and was gathered with great care. All the collections of the Geological Survey, Canada, have been studied, including those of T. C. Weston, H. M. Ami, M. Y. Williams, and the writer. The Hall collection in the American Museum of Natural History, New York, and the Dawson collection in the Peter Redpath Museum of McGill University, Montreal, have also been examined. It has not been possible, however, to see the collections of the United States National Museum at Washington; of the New York State Museum at Albany; or the Honeyman collection at Dalhousie College, Halifax.

In 1918 a summary[1] of the more important conclusions was published and some new brachiopod and pelecypod genera were announced. In the same year an interpretation of some of the trilobite genera[2] from Arisaig was published.

Grateful acknowledgment is made to Professor Charles Schuchert, of Yale University, under whose supervision the work was done, particularly for assistance with the systematic description of the fossils and with the correlation. Professor R. S. Lull, the late Professor Joseph Barrell, Miss C. M. Levine, and other members of the Geological Department of Yale University, gave helpful advice and criticism. For information regarding the thicknesses and for much of the lithological data, acknowledgment is made to the field notes and publications of Professor W. H. Twenhofel, of the University of Wisconsin, and Professor M. Y. Williams, of the University of British Columbia.

E. M. Kindle, of the Geological Survey, read and criticized the manuscript. Dr. Gertrude L. Elles, an English authority on the Graptolitoidea, kindly identified an important graptolite species. Dr. C. R. Reeds, of the American Museum of Natural History, made available the Hall collection. Miss A. E. Wilson made possible the examination of Billings' types of Arisaig pelecypods.

The drawings in the plates are the work of Mr. G. S. Barkentin, Albany, New York, and of A. Miles, of the Victoria Memorial Museum. Mr. Miles also retouched the photographs and the negatives in the heliotype process.

HISTORY OF ARISAIG INVESTIGATION

Gesner's "Geology and Mineralogy of Nova Scotia" contains the first reference to the Arisaig locality; greywacke slate is said[3] to occupy "the East river of Merigomish" and to extend to Arisaig pier.

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[1] McLearn, F. H., Am. Jour. Sci., 45, 1918, pp. 126-140.
[2] McLearn, F. H., Ottawa Nat., 32, 1918, pp. 31-36.
[3] Gesner, Abraham, "Geology and Mineralogy of Nova Scotia," Halifax, 1836, p. 64.

In 1845 J. William Dawson noted[1] the presence of dark shales, thin beds of limestone, and some reddish shale and conglomerate "between McAras brook and Arisaig." The age of the strata was given as "mostly Silurian" and eight genera were listed. In 1850 he described strata at Arisaig containing Silurian fossils, but added that Hall had assigned a Hamilton or Chemung age[2] to some Arisaig fossils submitted to him. In the first edition of "Acadian Geology"[3] Dawson repeated Hall's correlation. Three Arisaig species are illustrated. In appendix A[4] two species of brachiopods and three of pelecypods, identified by Hall, are listed under Devonian and Upper Silurian; they are all given the names of New York Devonian species and in Hall's eyes the fauna evidently has a Devonian caste.

The Hamilton-Chemung correlation was soon revised. In 1859, in a letter to Honeyman, Dawson advocated a Lower Helderberg age for the Arisaig beds.[5] A year later, he reverts[6] to his original opinion that the strata are Silurian. The section is resolved into two subdivisions. The lower shaly part is correlated, on the advice of Hall, with the Clinton of New York and the Upper Llandovery of England. A list of eleven typical species of fossils is given. The upper and more calcareous part is considered to be somewhat higher than Clinton, and probably Upper Silurian. A list of 8 species and 7 genera is given. The Devonian species cited in 1855 are discarded. They are replaced by familiar Silurian species and 39 species described as new by Hall,[7] who now advises a correlation with the Silurian.

In the second edition of "Acadian Geology"[8], the correlation and classification presented in the above paper are repeated with the exception that the upper part is compared with the Lower Helderberg of New York and the Ludlow of England. The correlation with the English horizons follows that already made by Honeyman. The suggestion is made that the strata discovered by Honeyman in 1860, his Division A, may be the equivalent of the Medina and Oneida of New York.

As early as 1860 Dawson[9] erected two new species of cephalopods. He also described the cephalons of two trilobites.[10] Later he described[11] an almost complete specimen of *H. dawsoni*. In a paper[12] on the Silurian iron ores of Pictou county in 1881, four new species are made which occur also at Arisaig.

In 1859 the Reverend David Honeyman[13] identified 12 species and a number of genera from Arisaig and considered them Upper Silurian. He thus corrected the previously expressed opinion of Hall, that the strata were of a Devonian (Hamilton) age. He also recognized the similarity of the Arisaig faunas to those of Great Britain. In the following year

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[1] Dawson, J. W., Quart. Jour. Geol. Soc., London, 1, 1845, p. 30.
[2] Dawson, J. W., Quart. Jour. Geol. Soc., London, 6, 1850, p. 351.
[3] Dawson, J. W., "Acadian Geology," 1st ed., Edinburgh, 1855, p. 315.
[4] Dawson, J. W., "Acadian Geology", 1st ed., Edinburgh, 1855, p. 379.
[5] Honeyman, Rev. D., Trans. N.S. Inst. Nat. Sci., 3, p. 6.
[6] Dawson, J. W., Can. Nat. Geol., 5, 1860, pp. 132-143.
[7] Hall, James, Can. Nat. Geol., 5, 1860, pp. 144-159, text figs.
[8] Dawson, J. W., "Acadian Geology," 2nd ed., London, 1868.
[9] Dawson, J. W., Footnote, Can. Nat. Geol., 5, 1860, p. 155, Fig. 16; p. 298.
[10] Dawson, J. W., Note, Can. Nat. Geol., 5, 1860, p. 298.
[11] Dawson, J. W., Geol. Mag. Lond., (2), 4, 1877, p. 57.
[12] Dawson, J. W., Can. Nat., n. ser., 9, 1881, pp. 313-314, 332-344.
[13] Honeyman, Rev. D., Trans. Lit. and Sci. Soc., Halifax, 1859, pp. 19-29.

Honeyman[1] discovered at Lochaber lake and on Doctor brook a new group of fossiliferous strata older than any previously recognized. This was the first recognition of the strata which are now placed in the Beechhill formation. In 1862 Honeyman had charge of a Nova Scotian exhibit at the London International Exhibition and there he met Murchison and Salter. With Salter's aid he arranged the Arisaig rocks into stratigraphic units and correlated these with their English equivalents.[2] Honeyman indicated his subdivisions by letters:

A = Mayhill sandstone
B
B^1 } = Lower Ludlow
C = Aymestry limestone
D = Upper Ludlow

For each subdivision fossils are listed. The only important difference between this classification and the latest, by M. Y. Williams, is that the strata of the present McAdam and Moydart formations are undivided under C. Division D corresponds to the present Stonehouse, B and B^1 together are almost equivalent to the Ross Brook, and A is equal to the Beechhill and the flow of aporhyolite. Honeyman continued his studies. After reading Hall's "noble work on the Canadian Graptolites" he concludes[3] that the graptolites of B indicate a Hudson River age for that division. He also accepts Dawson's and Hall's correlation for B^1 and gives the American equivalents of C and D. His correlations are now as follows:

A and B = "probably equivalent to the Hudson River group—Lower Silurian" (Ordovician).
B^1 = Clinton
C = Niagara limestone
D = Lower Helderberg } Upper Silurian

In 1870 Honeyman[4] agrees with Dawson's suggestion of an Oneida age for his Division A, thus refuting his statement of 1867, which was for an Ordovician age. He also reported new fossils from Division B and found that *Graptolithus clintonensis* passed down into it. In 1874 he[5] correlated the metamorphic band (aporhyolite) of A with the Oneida conglomerate and the fossiliferous strata of A with the Medina. In 1886, Honeyman[6] goes back to his old opinion of a Lower Silurian (Ordovician) age for A and B and cites the support of Hall in this contention.[7]

In 1870 T. R. Jones[8] contributed some data on Entomostraca.

As far back as 1860 Billings described[9] from the Arisaig beds a new starfish, *Palaeaster parviusculus*. In 1874 he erected[10] 18 new species of lamellibranchs and one new genus, all based on Arisaig material. Whiteaves[11] relates that when Billings died in 1876 he left undescribed much material from Arisaig to which he had devoted a great deal of study.

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[1] Honeyman, Rev. D., Can. Nat. Geol., 5, 1860, pp. 293-299.
[2] Honeyman, Rev. D., Quart. Jour. Geol. Soc., London, 20, 1864, pp. 333-345.
[3] Honeyman, Rev. D., Trans. N.S. Inst. Nat. Sci., 1, 1867, pt. 4, pp. 105-120.
[4] Honeyman, Rev. D., Quart. Jour. Geol. Soc., London, 26, 1870, pp. 490-492.
[5] Honeyman, Rev. D., Trans. N.S. Inst. Nat. Sci., 3, 1874, pp. 6-18.
[6] Honeyman, Rev. D., Trans. N.S. Inst. Nat. Sci., 6, 1886, pp. 303-325.
[7] Honeyman, Rev. D., Trans. N.S. Inst. Nat. Sci., 7, 1890, pp. 14-17.
[8] Jones, T. R., Quart. Jour. Geol. Soc., Lond., 26, 1870, p. 492.
[9] Billings, E., Can. Nat. Geol., 5, 1860, pp. 69-70.
[10] Billings, E., Geol. Surv., Can., Pal. Foss., 2, 1874, pt. 1, pp. 129-144.
[11] Whiteaves, J. F., Can. Nat., 2nd ser., 8, 1878, p. 261.
Ami, H. M., Am. Geol., 27, p. 271.

Henry M. Ami carried on the palæontological work begun by Billings and Dawson. In 1892 he published a "Catalogue of Silurian Fossils from Arisaig, N.S."[1] which is a list, arranged biologically, of all the fossils collected and identified by him. It includes in all 163 species. Three years later he described[2] 5 new species from the Silurian of cape George, Antigonish county. In 1901 he noted[3] an interesting occurrence of tracks in the Knoydart formation under the name of *Ichthyoidichnites acadiensis.*

In 1897, Whiteaves[4] described a new fish tooth from the Arisaig Silurian, *Dendrodus arisaigensis,* considering it to be probably crossopterygian.

Both Fletcher and Ami carried on field investigations at this time. Fletcher's conception of the subdivision of the strata[5] is similar to that of Honeyman, and he largely adopts Honeyman's correlations. The divisions are almost the same, but in designating them the letters of Honeyman are replaced by a numerical system and by formation names borrowed from the New York section. Carefully measured sections are given, with details of the lithology, but no fossil lists accompany them. His classification of the Silurian is as follows:

E. 1. Medina = A of Honeyman.
E. 2. {Lower Clinton = B " "
{Upper Clinton = B^1 " "
E. 3. Niagara = C " "
E. 6. Lower Helderberg = D " "

In 1900 Ami[6] proposed to subdivide the marine section into four units, which, in descending order, were designated Stonehouse, Moydart, McAdam, and Arisaig. The critical fossils on which the new classification was based were not cited, and the limits of the proposed divisions were not defined. In a note in Science[7] Ami raised the question of the nature of the Stonehouse-Knoydart contact, but did not discuss the problem.

Twenhofel's[8] stratigraphic division of the Silurian strata of Arisaig is more detailed than any heretofore attempted. Forty zones are discriminated and a list of type fossils is cited for each. These zones are grouped into numbered division units, the limits of which are accurately defined. Their relation to Ami's formations is interpreted. Twenhofel's classification is summarized below:

Twenhofel	Ami	Fletcher	Honeyman
Division I zone 1........	Arisaig..........	Medina................	A
II zones 2-12.....	"	Lower and Upper Clinton approx..............	B, B^1
III zones 13-27....	McAdam........	Niagara...............	C
IVa zones 28-32....	Moydart.........		
IVb zones 33-41....	Stonehouse.......	Lower Helderberg......	D

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[1] Ami, H. M., Trans. N.S. Inst. Sci., ser. 2, 1, 1892, pp. 185-192.
[2] Ami, H. M., Trans. N.S. Inst. Sci., ser. 2, 8, 1895, pt. 4, pp. 411-415.
[3] Ami, H. M., Trans. N.S. Inst. Sci., n. ser., 10, pt. 2, 1901, pp. 330-332.
[4] Whiteaves, J. F., Rept. Brit. Assoc. Adv. Sci., 1897, pp. 656-657.
[5] Fletcher, Hugh, Geol. Surv., Can., Ann. Rept., 1886, 2, pp. 5-128.
[6] Ami, H. M., Trans. Roy. Soc. Can., 2nd ser., 6, 1900, sec. IV, p. 203.
[7] Ami, H. M., Science, n. ser., 13, Mar. 8, 1901, p. 395.
[8] Twenhofel, W. H., Am. Jour. Sci., (4), 28, 1909, pp. 143-169.

The rock basement on which Division I rests is identified as a rhyolite. Twenhofel briefly refers to the evolution of the faunas, considering that of *Spirifer* and of *Chonetes*.

Professor Schuchert adds some notes to Twenhofel's paper. The fauna is considered to have "more in common with the Cumberland trough ....than with the faunas of western New York or the Mississippi valley." Division I is compared with the Clinton of America and the Lower Llandovery of Norway, no Medina fossils being found. Division II, or Arisaig, is correlated with the Clinton and the lower part of the Llandovery and possibly also part of the Upper Llandovery of Norway. The McAdam is correlated with the Rochester of America and with the Upper Llandovery and possibly also some of the Lower Wenlock of Europe. The Moydart is said to be the equivalent in time of the Waldron and Louisville of America and the Upper Wenlock of Norway. The Stonehouse is compared with the Guelph and the Ludlow. No evidence, whatever, of Helderberg age is found; thus for the first time this erroneous correlation, held from the time of Dawson's earliest work, is corrected.

M. Y. Williams[1] makes some changes in the nomenclature. Division I of Twenhofel is given the new formation name of Beechhill and Division II or Arisaig formation receives the new name of Ross Brook. Arisaig is given higher rank and as a series name is applied to the whole marine Silurian column. The zone of strata on Arisaig brook containing the iron-ore bed is added to the base of the McAdam, and its absence in the shore exposure is shown to be the result of faulting. Williams' zonal classification is given below. Each formation and each zone is accompanied by a list of its guide fossils.

Division	I—Beechhill formation	Zone 1
"	II—Ross Brook formation	Zones 2-4
"	III—McAdam formation	Zones 5-8
"	IV—Moydart formation	Zones 9-10
"	V—Stonehouse formation	Zones 11-12

A subaerial origin is proposed for the "red stratum" or zone 10. Williams considers that there is a marked unconformity between the Stonehouse and Knoydart formations and that much of the former was eroded before the deposition of the latter. The volcanic rock at the base of the section is considered to be a flow and the name of aporhyolite applied to it.

In his revision of the Palæozoic Stelleroidea, Schuchert[2] emends the description of *Palæaster parviusculus* Billings and provisionally refers it to the genus *Mesopalæaster* Schuchert. Ruedemann[3] has recently described a new starfish from Arisaig, *Urasterella ruthveni* mut. *arisaigensis*. It is from the Stonehouse formation.

STRATIGRAPHY

The Silurian Arisaig series includes 3,800 feet of sandstone, calcareous sandstone, and shale. An almost continuous exposure is displayed in the cliffs along the shore from Arisaig pier to Stonehouse brook and up Stonehouse brook a little way, a total distance of about 2½ miles. There is only one break in this section and the missing strata are exposed on Arisaig brook. The basal beds are best shown on the lower part of Doctor brook; on Rory McDonald brook; and at Beechhill cove. These sections furnish most of the evidence on which the succession is based. Less continuous and shorter-ranging sections are exposed on Arisaig, Smith, and McAdam brooks, and the evidence obtained from them supplements the contributions of the more important sections.

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[1] Geol. Surv., Can., Mem. 60, 1914.

[2] Schuchert, Chas., Bull. U.S. Nat. Mus. 88, 1915, p. 87.

[3] Ruedemann, Rudolf, Bull. N.Y. State Mus., 189, 1916, p. 46.

The basal beds of the series rest upon a flow of aporhyolite, probably of late Lower Ordovician age.[1] The surface of the flow is uneven, and the basal strata contain material derived from the erosion of the aporhyolite. The contact, therefore, is of the nature of an unconformity, although no angular unconformity with the aporhyolite has been observed. Nowhere in the district is there a contact of the Silurian strata with the Lower Ordovician sedimentary and fossiliferous beds; Williams, however, considers that these Lower Ordovician beds were folded in the late Lower Ordovician and that the folding was followed by volcanic activity, during which the rhyolitic flow was extruded. This would make the relation of the Silurian to the Lower Ordovician sedimentary terrains that of an angular unconformity. It is desirable that a locality be sought and studied where the basal beds of the Arisaig series are in contact with the sedimentary and fossiliferous terrains of the Ordovician.

The Arisaig series is overlain by the Lower Devonian (?) Knoydart formation.[2] The contact of the highest formation of the Arisaig series—the Stonehouse—with the Knoydart is concealed. Only the outcrops on Stonehouse and McAdam brooks give evidence as to its nature. The earlier workers assumed a conformable contact (or at least lack of angular unconformity) and at the same time a synclinal structure in the area drained by McAdam and Stonehouse brooks. Field examination shows that at Arisaig these two opinions are incompatible. Two other hypotheses may be considered. The first is that of angular unconformity[3] and it rests on the interpretation of the structure as being synclinal. The second revives the old idea of conformability[4] or disconformability and follows from a rejection of a synclinal structure. The exposures unfortunately do not give enough information to weigh these two hypotheses and eliminate one of them. Both must stand until a more favourable locality furnishes the required evidence.

The Arisaig series is divided into five formations, Beechhill, Ross Brook, McAdam, Moydart, and Stonehouse, and these are subdivided into lettered zones.

BEECHHILL FORMATION

The strata of this formation outcrop on Doctor brook below the bridge; in detached exposures in the woods to the east; on both sides of Beechhill cove; and on Rory McDonald brook. Formerly there were good exposures at Arisaig pier, but these are now covered by sand. At all these localities the basal beds rest upon the aporhyolite. The contact is irregular, showing that the sea advanced over an uneven surface of the volcanic flow. On Doctor brook, Williams discovered a local bed of conglomerate, bearing pebbles of the volcanics; this conglomerate may have resulted in part at least from the working over of fragments of the breccia, which in some places lies at the top of the flow. At the contact on Rory McDonald brook, the basal sediments of the Beechhill are red, apparently from grains of the aporhyolite. Sandstone is the most common sediment, but there are also arenaceous shales present, and lenses of slightly calcareous sandstone. Fossils are fairly common at Beechhill cove and on Rory McDonald brook a short distance above its mouth. The formation is 160 to 200 feet thick.

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[1] Williams, M. Y., Geol. Surv., Can., Mem. 60, 1914, p. 89; p. 112; p. 131.

[2] Ami, H. M., Bull. G. S. A., 12, 1901, pp. 301-312.
See also McLearn, F. H., Am. Jour. Sci., 45, 1918, p. 135.

[3] Williams, M. Y., Geol. Surv., Can., Mem. 60, 1914, p. 91.

[4] *See* Figure 1.

The Beechhill fauna contains 18 species (including one doubtfully placed) and includes 1 Anthozoa, 2 Vermes, 9 Brachiopoda, 1 Pelecypoda, 3 Gastropoda, 1 Pteropoda, and 1 (?) Trilobita. Ten species are confined to this formation, of which the following are the more common: *Heliophrentis bilateralis* var. *beechhillensis* n. var., *Schizophorella arisaigensis* n. sp., *Camarotoechia bimesiornata* n. sp., *Whitfieldella*? *crassa* var. *beechhillensis* n. var., and *Cyclonema parvimedium* n.sp.

ROSS BROOK FORMATION

This formation is 825+ feet thick. The base is best exposed on Doctor brook and at Beechhill cove, where the black shales of the Ross Brook follow the sandstones of the Beechhill conformably. With the exception of the lowest shales, a complete section is obtained along the shore between Ross brook and a point a little west of Smith brook.

The Ross Brook fauna contains 51 species, plus one species doubtfully placed. It includes 1 Anthozoa (?), 2 Graptolitoidea, 5 Vermes, 21 Brachiopoda, 14 Pelecypoda, 2 Gastropoda, 2 Pteropoda, 2 Cephalopoda, and 3 Trilobita. Of the 51 species 8 were in the Beechhill and 43 appear for the first time. Thirty species are confined to this formation, of which the more common are: *Retiolites geinitzianus* mut. *venosus* (Hall), *Monograptus clintonensis* (Hall), *Lingula subacutirostris* n.sp., *Schizocrania megumaensis* n.sp., *Camarotoechia llandoveriana* var. *rossonia* n. var., *Pectorhyncha antiqua* n.sp., *Plagiorhyncha decemplicata* (Sowerby), *P. glassi* (Davidson) = *Atrypa depressa* (Sowerby), *Coelospira hemispherica* (Sowerby), *Leptodesma subrhomboidea* n.sp., and *Dalmanites weaveri* (Salter).

Zone a. Barren Black Shale Zone, about 100 feet thick

The rocks of this zone are exposed at the bridge on Doctor brook and at Beechhill cove and are concealed in the shore section between Arisaig pier and the lobster factory. They consist of black, carbonaceous, paper-thin shales. No recognizable fossils have been found in them.

Zone b. Zone of the First Appearance of Coelospira hemispherica (Sowerby) *and Plagiorhyncha decemplicata* (Sowerby), *about 365 feet thick*

The rocks of zone b are exposed in the sea-cliffs along the shore from west of the lobster factory almost to the mouth of Arisaig brook. They consist below of very fine-grained, dark, rusty, and somewhat carbonaceous shales which upward become more and more grey and greenish grey in colour, coarser in texture, and less carbonaceous; with this change thin lenticular layers of crossbedded sandstone appear. Fossils are rare in the lowest beds and more common above. In the lower beds they are found in concretions, each concretion containing a colony of one species only. *Plagiorhyncha decemplicata* (Sowerby) and *Coelospira hemispherica* (Sowerby) are the first brachiopods to come in and the latter is much dwarfed at some horizons. At higher levels other brachiopods appear, including *Dalmanella wisbyensis* var. *nana* n. var., and *Atrypa reticularis* (Linn.). The graptolite *Monograptus clintonensis* (Hall) first appears in this zone.

Zone c. Zone of Plagiorhyncha plastica n.sp., *about 25 feet thick*

The dark grey shales of this zone are exposed at the mouth of Arisaig brook. They record the ephemeral appearance of the remarkable brachiopod, *Plagiorhyncha plastica* n.sp., and its new variety, *media*, which together exhibit all variations between a plicate rhynchonellid and a finely striate one. *Chonetes tenuistriatus* Hall first occurs in this zone.

Zone d. Zone of Camarotoechia llandoveriana var. *rossonia* n. var., *about 190 feet thick*

The strata of zone d outcrop along the shore from a little west of the mouth of Arisaig brook to a small fault within 40 yards of Smith brook. They are also exposed in the bed of Arisaig brook. They consist of grey and greenish grey shales and arenaceous shales, lenticular, thin (1 to 8 inches), crossbedded, grey sandstones, and rare, lenticular, calcareous sandstones. A few fossils are found in the calcareous sandstone, but the majority are in shale. *Leptodesma subrhomboidea* n.sp. and *Cyclonema haliburtoni* n.sp., as well as the typical zone species, are confined to this zone. *Retiolites geinitzianus* mut. *venosus* (Hall), *Serpulites longissimus* Murchison, *Lingula subacutirostris* n.sp., *Schizocrania megumaensis* n.sp., *Modiolopsis rossonia* n.sp., and *Dalmanites weaveri* (Salter), first appear in this zone. *Plagiorhyncha glassi* (Davidson) (=*Atrypa depressa* Sowerby) is very common.

Zone e. Zone of Pectorhyncha antiqua n.sp., *about 145 feet thick*

The rocks of zone e are exposed along the shore from a small fault east of Smith brook to a fault west of Smith brook, and also outcrop on that stream. They consist of dark grey and greenish shales, and some beds of grey, lenticular, crossbedded sandstone. The fossils are chiefly in shale. *Pectorhyncha antiqua* n.sp., is abundant, and the long-ranging *Hyolithes forbesi* (Sharpe) and *Kionoceras angulatum* (Wahl.) appear for the first time. *Coelospira hemispherica* (Sowerby), *Monograptus clintonensis* (Hall), *Retiolites geinitzianus* mut. *venosus* (Hall), and *Dalmanites weaveri* (Salter) do not go higher than this zone.

MCADAM FORMATION

The basal part of the McAdam is exposed in the gorge of Arisaig brook, but owing to faulting is absent from the shore section. The remainder of the formation is exposed along the shore from the fault west of Smith brook almost to Moydart point. There are also outcrops on the lower part of McAdam brook. The thickness is 1,120 feet.

The fauna contains 57 species, plus 2 additional species, doubtfully placed, and includes 1 Graptolitoidea, 1 Vermes, 19 Brachiopoda, 25 Pelecypoda, 1 Stelleroidea (probably), 3 Gastropoda, 3 Pteropoda (1 doubtfully placed), 2 Cephalopoda, 3 Trilobita, and 1 Ostracoda. Of the 57 authentic McAdam species 15 are derived from the Ross Brook and 42 appear for the first time. Twenty-seven species are confined to the McAdam, the more common of which are: *Idiorthis matura* n.sp., *Pectorhyncha obtusiplicata* (Hall), *Delthyris crispa* (Hisinger), *Arisaigia postornata* McLearn, and *Orthonota arisaigensis* n.sp.

Zone a. Iron-ore Zone or Zone of Meristina billingsi (Dawson), *100+ feet thick*

On account of faulting the rocks of this zone are absent from the shore section, but are well exposed in steep cliffs in the gorge of Arisaig brook. They consist of shales and thin sandstones and also a bed of slightly oolitic red hematite near the middle of the section. The ore bed is somewhat irregular in thickness and averages about 2 feet. Most of the fossils of zone a are in the ore bed, the shales being almost barren. *M. billingsi* (Dawson) and the very rare *Dalmanites* sp. are confined to this zone. The few remaining species have a range beyond the limits of the formation.

Zone b. Zone of Idiorthis matura n.sp., *and the First Appearance of Pectorhyncha obtusiplicata* (Hall), *about 545 feet thick*

The strata of zone b are exposed along the shore from the fault west of Smith brook to the mouth of McAdam brook. They consist of dark grey and greenish grey shales, arenaceous shales, arenaceous flags, and lenticular, calcareous, fine sandstones. Fossils are found chiefly in calcareous sandstone and in shale. The following are confined to this zone: *I. matura* n.sp., *Eatonioides westoni* n.sp., *Tancrediopsis lauta* n.sp., and *Pterinea antigonishensis* n.sp. The following first appear in this zone: *Pectorhyncha obtusiplicata* (Hall), *Arisaigia postornata* McLearn, *Orthonota arisaigensis* n.sp., *Dalmanella elegantula* var. *submedia* n.var., *Nuculites concentricus* (Hall), *N. concentricus* var. *subovatus* (Hall), *N. cawdori* (Sowerby), *N. cawdori* var. *elongatus* (Hall), and *Plectonotus trilobatus* (Sowerby). *Chonetes tenuistriatus* (Hall), which was in the Ross Brook, returns, and is a common fossil.

Zone c. Zone of Delthyris crispa (Hisinger) *and Dalmanella elegantula* mut. *transversaria* n. mut., *about 475 feet thick*

The rocks of zone c extend along the shore from the mouth of McAdam brook to Moydart point; they are also exposed on the lower part of McAdam brook. They consist of dark grey to black, carbonaceous, fine shales, containing concretions at some horizons and a few thin, lenticular, crossbedded sandstone layers. The argillaceous character makes its impress on the fauna, which at certain horizons in the upper part includes numerous pelecypods. All the fossils are in shale. The brachiopods, *Delthyris crispa* (Hisinger) and *Dalmanella elegantula* mut. *transversaria* n. mut. are confined to this zone. *Pectorhyncha obtusiplicata* (Hall) and *Chonetes tenuistriatus* (Hall) do not go higher. Most of the pelecypods introduced in zone b continue into zone c. The following pelecypods are confined to zone c: *Grammysia unilira* n.sp., *Honeymania planimarginata* McLearn, *H. elongata* n.sp., *Arisaigia postornata* var. *brevis* n. var., *Modiolopsis haliburtoni* n.sp., and *Orthonota pressiornata* n.sp. The long-ranging *Nuculites cawdori* var. *erectus* (Hall) first appears in this zone. *Monograptus wandalensis* (Watney and Welch) is common at one horizon.

MOYDART FORMATION

This formation is about 380 feet thick and is exposed in a complete section along the shore from Moydart point to a little west of the mouth of McDonald brook. It is also found on McAdam brook, below the bridge.

Zone a. Fossiliferous Zone, 348 feet thick

The strata of this zone consist of greenish grey or bluish grey, thinbedded shales, arenaceous shales, arenaceous flagstones, arenaceous, argillaceous, hard, nodular beds, probably somewhat calcareous, lenticular, crossbedded sandstones, and lenses of calcareous, fine sandstone. Ripplemarking is present in some beds. Fossils are particularly common in the calcareous sandstone lenses. A few thin beds have many broken shells, i.e. are coquinnas. The fauna of zone a contains 36 species and includes 3 Vermes, 15 Brachiopoda, 6 Pelecypoda, 3 Gastropoda, 2 Pteropoda, 4 Cephalopoda, and 3 Trilobita. In addition one pelecypod is doubtfully referred to this formation. The slight increase in Cephalopoda and Trilobita, and the falling off in Pelecypoda, are to be noted. Of the 36 species referred with certainty to this zone 15 are derived from earlier faunas, 14 from the McAdam, and one from the Ross Brook. Twenty-one appear for the first time. Ten species are confined to this formation, of which the following are the more common: *Eatonioides lamellornatus* McLearn, *Wilsonia wilsoni* var. *saffordi* (Hall), *D. crispa* mut. *moydartensis* n. mut., *Seelya moydartensis* n.sp., and *Orthoceras ludense* var. *camerini* n. var. The following are among the species restricted to, and common to, the Moydart and the Stonehouse: *Lingula lewisi* Sowerby, *Orbiculoidea novascotica* (Ami), *Chonetes novascoticus* Hall, *Camarotoechia squamifera* n.sp. (very rare in the Stonehouse), *Goniostropha aciculata* (Hall), and *Dalmanitina logani* var. *conservatrix* McLearn. The fauna of the Moydart is too uniformly distributed to admit of zonal arrangement and no species succession is displayed within its limits. The Red bed is separated from the fossiliferous part.

Zone b. Red Bed Without Fossils, 32 feet thick

This has been described by Twenhofel as follows: "A brick-red shale of which the upper 30 feet is prismatic and locally nodular. Shows little evidence of stratification except near its base. It is rather sharply differentiated from the overlying green shales, but grades into the subjacent zone. Twenty feet below the top is a nodular band 10 inches thick. The nodules are bright green to greenish white in colour and have their longer axes transverse to the bedding. The same colour shows along the fracture lines. At the base are included 27 inches of thin beds of ferruginous limestone and shale which form the transition" to the beds below.

STONEHOUSE FORMATION

This formation is exposed in a complete section from the top of the Red bed, at McDonald brook, along the shore to Stonehouse brook, and upstream to the last exposures of the Arisaig series on that brook. It is also exposed in the open fields east of Stonehouse brook; on McPherson brook, and on McAdam brook from just below the bridge nearly up to the private road above the bridge. The highest beds of the formation are unknown and are concealed in Stonehouse field between the highest exposed Stonehouse strata on Stonehouse brook and the lowest exposed Knoydart on a branch of McAras brook. The thickness is 1,275 feet.

The Stonehouse fauna contains 103 species, including 2 Vermes, 1 Stelleroidea, 28 Brachiopoda, 46 Pelecypoda, 6 Gastropoda, 2 Pteropoda, 9 Cephalopoda, 4 Trilobita, and 5 Ostracoda. In addition, the following are probably from this formation: 4 Brachiopoda, 8 Pelecypoda, 2 Gastropoda, 1 Cephalopoda, and 1 Trilobita. Of the 103 authentic species, 39 are derived from previous faunas, including 25 from the Moydart, 11 from the McAdam (chiefly pelecypods), and 3 from the Ross Brook. Sixty-four appear for the first time, and are confined to this formation; the more common of these are: *Dalmanella lunata* (Sowerby), *Brachyprion gilpini* (Dawson), *Camarotoechia glomerosa* n.sp., *Delthyris rugaecosta* (Hall), *D. rugaecosta* var. *subsulcata* (Hall), *Grammysia triangulata* (Salter), *G. obliqua* (McCoy), *Palaeoneilo attenuata* (Hall), *Palaeopecten danbyi* (McCoy), *Pteronitella venusta* Billings, *Cosmogoniophora bellula* (Billings), *Modiolopsis exilis* Billings, *M. rhomboidea* Hall, *Orthonota angulifera* (McCoy), *Orthoceras antigonishense* n.sp., *Dawsonoceras elegantulum* (Dawson), *Homalonotus dawsoni* Hall, and *Leperditia sinuata* Hall.

Zone a. Zone of Delthyris rugaecosta mut. *prima* n. mut., *605 feet thick*

The rocks of zone a extend along the shore from the outcrop of the Red bed almost to McPherson brook, and consist of grey and greenish grey shales, greenish grey to bluish grey, lenticular, rubbly, argillaceous sandstones, and lenses of grey, calcareous, fine sandstone. Ripple-marking is present on some beds. Fossils are chiefly in the calcareous sandstone lenses. *Delthyris rugaecosta* mut. *prima* n. mut., is confined to this zone. *Dalmanella lunata* (Sowerby), in very rare specimens, *Brachyprion gilpini* (Dawson), *Grammysia triangulata* (Salter), *G. obliqua* (McCoy), *Pterinea honeymani* (Hall), and *Orthoceras antigonishense* n.sp., are among the species restricted to the Stonehouse that make their first appearance in this zone.

Zone b. Zone of the First Appearance of D. rugaecosta (Hall), *240 feet thick*

The rocks of this zone extend along the shore from a little east of McPherson brook to a little east of Stonehouse brook. They consist of grey-green or blue-grey shales and arenaceous shales, blue-grey arenaceous flags, hard arenaceous and argillaceous layers, and lenses of fine calcareous sandstone. Reddish tints begin to appear near the top. Fossils are common and are found in the lenses of calcareous sandstone and in shale. The following make their first appearance in this zone: *D. rugaecosta* var. *subsulcata* (Hall), *Palaeoneilo attenuata* (Hall), *Pthonia ? semiradiata* (Hall), *Arisaigia placida* var. *socialis* (Billings), *Cosmogoniophora bellula* (Billings), *Cosmogoniophora bellula* var. *elongata* n. var., *Modiolopsis exilis* (Billings), *M. rhomboidea* Hall, *M. rhomboidea* var. *subnasuta* (Hall), *Orthonota angulifera* (McCoy), *Liospira marklandensis* n.sp., *Dawsonoceras elegantulum* (Dawson), and *Homalonotus dawsoni* Hall.

Zone c. Zone of Red Shale and Sandstone, 230 feet thick

The rocks of zone c outcrop along the shore from east of Stonehouse brook westward to the highest exposures of the shore section. They consist of red and green and bluish green, hard, flinty, arenaceous flags, crossbedded sandstones, shales, arenaceous shales, and lenses of fine, calcareous sandstone. Ripple-marking is present in some layers. Fossils are very abundant and are found chiefly in shale and calcareous sandstone. The following make their first appearance in this zone: *Nuculites concentricus* var. *subequilatus* n. var., *Tropinuculites carinatus* (Hall), *Arisaigia placida* (Billings), *Orthonota incerta* Billings, and *Camarotoechia glomerosa* n.sp. Nearly all the species listed from zones a and b are also in this zone and more abundant there.

Zone d. Zone of Grey and Greenish Shales and Sandstones, 200 feet thick

The rocks of this zone outcrop on Stonehouse brook for a distance of about 660 feet from its mouth and overlie the highest red strata on the shore. They strike north 70 degrees west to north 55 degrees west and dip 30 degrees to 25 degrees southwest. As the brook crosses the strike at only a small angle, not more than 200 feet are exposed. The rocks consist of grey-green shales, sandstones, and a few beds of lenticular, fine, calcareous sandstone. In contrast to the rocks below there are no red colours present and the calcareous beds are less common.

No new elements are introduced in the fauna, which is a continuation of that in zone c. The marine fauna persists to the very top of the exposed section. Among the more common species of this zone are *Dalmanella lunata* (Sowerby), *Brachyprion gilpini* (Dawson), *Chonetes novascoticus* (Hall), *Camarotoechia glomerosa* n.sp., *Delthyris rugaecosta* Hall, *D. rugaecosta* var. *subsulcata* (Hall), *Grammysia triangulata* (Salter), *Palaeoneilo attenuata* (Hall), *Nuculites concentricus* Hall, *N. concentricus* var. *subovatus* (Hall), *N. cawdori* (Sowerby), *N. cawdori* var. *elongatus* (Hall), *N. cawdori* var. *erectus* (Hall), *P. ? semiradiata* (Hall), *Arisaigia placida* var. *socialis* (Billings), *Tropinuculites carinatus* (Hall), *Pterinea honeymani* (Hall), *Pteronitella venusta* Billings, *P. venusta* var. *oblonga* (Billings), *P. curta*

Billings, *P. altiformis* n.sp., *Modiolopsis exilis* Billings, *M. rhomboidea* (Hall), *Orthonota angulifera* (McCoy), *O. incerta* Billings, *Paracyclas fletcheri* n.sp., *Kionoceras angulatum* (Wahlenberg), and *Calymene intermedia* var. *antigonishensis* n. var.

The distance from the highest outcrop of this zone on Stonehouse brook to the nearest exposure of the Knoydart on a branch of McAras brook, measured at right angles to the strike, is 890 feet. Assuming an average dip of 28 degrees in this concealed part, the thickness of concealed strata is estimated at 420 feet.

Range of Species

rr = 1 — 5 Specimens; r = 5 — 15; c = 15 — 30; cc = 30 +

Genera and Species	Exact horizon unknown	Beechhill	Ross Brook					McAdam			Moydart		Stonehouse			
			a	b	c	d	e	a	b	c	a	b	a	b	c	d
Anthozoa																
Heliophrentis bilateralis var. beechhillensis n. var.		c														
Favosites cf. niagarensis Hall	rr[1]															
Graptolitoidea																
Retiolites geinitzianus mut. venosus (Hall)						c	rr									
Monograptus clintonensis (Hall)				c	c	c	c									
Monograptus wandalensis Watney and Welch										c						
Vermes																
Serpulites longissimus Sowerby						rr	rr				r		rr			
Conularia twenhofeli n. sp		rr					rr									
Conularia honeymani n.sp											rr					
Conularia antigonishensis n. sp							rr									
Cornulites serpularius Schlotheim		r		rr	rr	rr	rr	rr	rr	rr	c		c	c	c	r
Cornulites subdistans n. sp						c										
Echinodermata																
Mesopalaeaster parviusculus (Billings)	rr[2]															
Urasterella ruthveni var. arisaigensis Ruedemann															rr	
Brachiopoda																
Lingula clintoni Vanuxem		r		rr	rr		rr		rr							
Lingula subacutirostris n. sp						r	rr									
Lingula minima Sowerby															rr	
Lingula lewisi Sowerby											rr				r	
Lingula taeniola Hall and Clarke				rr			rr		rr		rr				rr	
Lingula (Palaeoglossa) distornata n. sp															rr	
Schizocrania megumaensis n.sp						r	rr									
Orbiculoidea subplana (Hall)						c	r		r	rr	r		rr	r	c	r
Orbiculoidea novascotica (Ami)											rr		r	rr	r	...
Pholidops acadiensis (Hall)						rr			rr		rr		rr	rr	cc	c
Dalmanella conservatrix n. sp				rr												
Dalmanella elegantula mut. primitiva n. mut		c														
Dalmanella elegantula var. submedia n. var									cc	cc	c		c	c	c	r

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[1] Probably from the Ross Brook.
[2] Probably from the McAdam.

Range of Species—Continued

rr = 1 — 5 Specimens; r = 5 — 15; c = 15 — 30; cc = 30 +

Genera and Species	Exact horizon unknown	Beechhill	Ross Brook					McAdam			Moydart		Stonehouse			
			a	b	c	d	e	a	b	c	a	b	a	b	c	d
Brachiopoda—Continued																
Dalmanella elegantula mut. transversaria n. mut.										c						
Dalmanella wisbyensis var. nana n. var.				cc	cc	cc	cc		rr							
Dalmanella lunata (Sowerby)													rr	rr	rr	r
Dalmanella orbicularis (Sowerby)																r[1]
Idiorthis avita n. sp.		rr														
Idiorthis matura n. sp.									r							
Rhipidomella hybrida (Sowerby)?										rr						
Schizophorella arisaigensis n. sp.		c														
Leptaena rhomboidalis (Wilckens)		c			rr	c	c	rr		r			r		r	
Rafinesquina beechhillensis n. sp.		cc		rr		rr		rr								
Brachyprion mertoni n. sp.									rr						c	
Brachyprion gilpini (Dawson)													c	r	r	r
Brachyprion? honeymani n. sp.															rr	
Amphistrophia arisaigensis n. sp.	rr[2]															
Schuchertella pecten (Linnaeus)				rr		rr	rr						rr			
Chonetes tenuistriatus Hall					rr	cc	cc		cc	cc						
Chonetes novascoticus Hall											cc		cc	cc	cc	cc
Chonetes novascoticus mut. crassistriatus n. mut.																rr[3]
Rhynchotreta robusta (Hall)?						rr										
Camarotoechia bimesiornata n. sp.		c														
Camarotoechia nucula var. planorugosa n. var.								r	c	c	c		c	c	c	c
Camarotoechia nucula mut. moydartensis n. mut.											c					
Camarotoechia llandoveriana var. rossonia n. var.						cc										
Camarotoechia marklandensis n.sp.													rr		rr	
Camarotoechia glomerosa n. sp.															cc	rr
Camarotoechia squamifera n. sp.											c		rr			
Pectorhyncha antiqua n. sp.							cc									
Pectorhyncha obtusiplicata (Hall)									rr	c						
Eatonioides westoni n. sp.									rr							
Eatonioides lamellornatus McLearn											c					
Wilsonia wilsoni var. saffordi (Hall)											c					
W. wilsoni mut. stonehousensis n. mut.	r[4]															
Plagiorhyncha decemplicata (Sowerby)				c		c										
Plagiorhyncha plastica n. sp.					c											
Plagiorhyncha plastica var. media n. var.					r											
Plagiorhyncha glassi (Davidson)						cc	rr									
Atrypa reticularis (Linnaeus)				rr	rr		rr		r				c	r		
Delthyris crispa (Hisinger)										c						
Delthyris crispa mut. moydartensis n. mut.											r					

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[1] In the Stonehouse and probably zone d.
[2] Probably from the Stonehouse.
[3] In the Stonehouse and probably zone d.
[4] Probably from the Stonehouse.

Range of Species—Continued

rr = 1 — 5 Specimens; r = 5 — 15; c = 15 — 30; cc = 30 +

Genera and Species	Exact horizon unknown	Beechhill	Ross Brook					McAdam			Moydart		Stonehouse			
			a	b	c	d	e	a	b	c	a	b	a	b	c	d
Brachiopoda—Continued																
Delthyris rugaecosta (Hall)														cc	cc	cc
Delthyris rugaecosta mut. prima n. mut													cc			
Delthyris rugaecosta var. subsulcata (Hall)														c	c	c
Eospirifer stonehousensis n.sp	rr[1]															
Rhynchospira salteri var. acadiae (Hall)											c		rr			
Rhynchospira sinuata Hall													r		c	
Whitfieldella? crassa var. beechhillensis n. var		c														
Whitfieldella? northumberlandensis n. sp											rr		rr			
Whitfieldella? cf. angustifrons (McCoy)		rr[2]														
Meristina tumida (Dalman) ?	rr[1]															
Meristina billingsi (Dawson)								c								
Coelospira hemispherica (Sowerby)				cc	r	cc	cc									
Pelecypoda																
Phthonia? semiradiata (Hall)														rr	c	r
Grammysia unilira n. sp										rr						
Grammysia cingulata mut. intermedia n. mut											rr					
Grammysia triangulata (Salter)													rr		rr	rr
Grammysia remota Billings															rr	
Grammysia obliqua (McCoy)													rr		cc	
Grammysia mcadamensis n. sp										rr						
Grammysia? speciosa (Billings)	rr[1]															
Cuneamya crassiornata n. sp				rr												
Cuneamya arata (Hall)															rr	
Cuneamya marklandensis n. sp															rr	
Nucula arisaigensis n. sp															r	
Palaeoneilo attenuata (Hall)														r	c	r
Palaeoneilo antigonishensis n. sp							rr									
Palaeoneilo twenhofeli n. sp														rr		
Tancrediopsis altistriata n. sp						rr										
Tancrediopsis mundiornata n. sp						rr										
Tancrediopsis lauta n. sp									rr							
Nuculites concentricus (Hall)									rr				rr	r	cc	r
Nuculites concentricus var. subovatus (Hall)									rr		rr			r	cc	c
Nuculites concentricus var. subequilatus n. var															c	rr
Nuculites cawdori (Sowerby)									rr	r				r	c	r
Nuculites cawdori mut. rossonia n. mut						rr	rr									
Nuculites cawdori var. elongatus (Hall)									r	c				rr	c	r
Nuculites cawdori var. erectus (Hall)										r					c	r
Nuculites honeymani n. sp										rr						
Nuculites novascoticus n. sp															rr	
Nuculites sp														rr		
Arisaigia postornata McLearn									r	cc						

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[1] Probably from the Stonehouse.
[2] Not present at Arisaig.

Range of Species—Continued

rr = 1 – 5 Specimens; r = 5 – 15; c = 15 – 30; cc = 30 +

Genera and Species	Exact horizon unknown	Beechhill	Ross Brook					McAdam			Moydart		Stonehouse			
			a	b	c	d	e	a	b	c	a	b	a	b	c	d
Pelecypoda—Continued																
Arisaigia postornata var. brevis n. var										cc						
Arisaigia placida (Billings)															c	
Arisaigia placida var. socialis (Billings)														r	cc	c
Tropinuculites carinatus (Hall)															c	r
Leda megumaensis n. sp														rr		
Honeymania planimarginata McLearn										rr						
Honeymania elongata n. sp										r						
Pterinea emacerata var. arisaigensis n. var						rr										
Pterinea prominiradiata n. sp										rr						
Pterinea antigonishensis n. sp									rr							
Pterinea honeymani (Hall)													rr	c	cc	c
Pterinea cancellata (Hall)													rr	r	c	r
Pterinea twenhofeli n. sp														rr[1]		
Pterinea marklandensis n. sp	rr[2]															
Pterinea amii n. sp	rr[2]															
Pterinea northumberlandensis n. sp	rr[2]															
Pterinea gesneri n. sp	rr[2]															
Pterinea stonehousensis n. sp														rr	rr	
Leptodesma subrhomboidea n. sp						c										
Leptodesma acadiensis n. sp														rr		
Palaeopecten danbyi (McCoy)																rr[3]
Pteronitella venusta Billings													rr	r	c	r
Pteronitella venusta var. oblonga (Billings)									rr		r			rr	r	r
Pteronitella curta Billings											r		rr	r	c	r
Pteronitella altiformis n. sp											rr			rr	rr	r
Pteronitella compressiformis n. sp							rr									
Pteronitella? beechhillensis n. sp		rr														
Mytilarca amii n. sp													rr			
Mytilarca sp	rr[4]															
Palaeocardia? woodmani n. sp	rr[5]															
Modiolopsis haliburtoni n. sp										cc						
Modiolopsis exilis Billings														r	cc	c
Modiolopsis rhomboidea Hall														r	cc	cc
Modiolopsis rhomboidea var. eurymyellaformis n. var															rr	rr
Modiolopsis rhomboidea var. subnasuta (Hall)														rr	rr	
Modiolopsis rossonia n. sp						cc	r									
Modiolopsis latouri n. sp						rr										
Modiolopsis sp						rr										
Goniophora consimilis Billings										rr					c	r
Goniophora mediocris Billings						rr				rr					r	rr
Goniophora laticostata n. sp									rr	rr						
Goniophora transiens Billings															r	
Goniophora montsi n. sp															rr	

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[1] In the Stonehouse and probably zone b.
[2] Probably from the Stonehouse.
[3] In the Stonehouse and probably zone d.
[4] Probably from the Stonehouse.
[5] Probably from the Moydart.

Range of Species—Continued

rr = 1 – 5 Specimens; r = 5 – 15; c = 15 – 30; cc = 30 +

Genera and Species	Exact horizon unknown	Beechhill	Ross Brook					McAdam			Moydart		Stonehouse			
			a	b	c	d	e	a	b	c	a	b	a	b	c	d
Pelecypoda—Continued																
Cosmogoniophora bellula (Billings)..														rr	r	r
Cosmogoniophora bellula var. elongata n. var.														rr	c	
Orthodesma? sp							rr									
Orthonota proundulata n. sp	rr[1]															
Orthonota arisaigensis n. sp									rr	r						
Orthonota venusta Billings	rr[1]															
Orthonota angulifera (McCoy)														rr	r	r
Orthonota pressiornata n. sp										rr						
Orthonota incerta Billings															rr	rr
Orthonota simulans Billings															r	r
Paracyclas fletcheri n. sp							rr			rr	rr		rr	r	cc	r
Palaeosolen antigonishensis n. sp										rr						
Palaeosolen amii n. sp										rr						
Gastropoda																
Plectonotus trilobatus (Sowerby)									rr	rr					c	
Bucania sp	rr															
Bellerophon sp															rr	
Bucanopsis sp	rr															
Bucanopsis? sp	rr															
Goniostropha aciculata (Hall)											rr		rr	rr	c	
Goniostropha? arisaigensis (Hall)	rr[1]															
Goniostropha? sp															rr	
Hormotoma amii n. sp	rr[1]															
Liospira cf. affinis (Foerste)		r				rr	rr			rr						
Liospira marklandensis n. sp														r	c	
Seelya moydartensis n. sp											c					
Cyclonema parvimedium n. sp		r														
Cyclonema haliburtoni n. sp						c										
Holopea caecistriata n. sp	rr															
Holopea reversa Hall	rr															
Holopea? sp		rr														
Diaphorostoma cornutum var. arisaigense n. var										rr	r				rr	
Pteropoda																
Hyolithes forbesi (Sharpe)							rr			rr	rr				r	
Tentaculites canadensis Ami		rr		rr	rr	c	rr		c	rr	c		r	r	c	r
Tentaculites canadensis var. obtusiformis n. var	rr[2]															
Cephalopoda																
Orthoceras mcadamensis n. sp										rr						
Orthoceras ludense var. camerini n. var											r					
Orthoceras antigonishense n. sp													rr		c	
Orthoceras punctostriatum Hall														rr		
Orthoceras confertiseptatum n. sp											rr			rr	rr	
Orthoceras marklandense n. sp															rr	
Orthoceras bullatum var. pictoense (Dawson)											c					
Orthoceras sp											rr					
Dawsonoceras elegantulum (Dawson)														r	c	r

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[1] Probably from the Stonehouse.
[2] Probably from the McAdam.

Range of Species—Continued

rr = 1 — 5 Specimens; r = 5 — 15; c = 15 — 30; cc = 30 +

Genera and Species	Exact horizon unknown	Beechhill	Ross Brook					McAdam			Moydart		Stonehouse			
			a	b	c	d	e	a	b	c	a	b	a	b	c	d
Cephalopoda—Continued																
Dawsonoceras arisaigense n. sp.										rr						
Kionoceras angulatum (Wahlenburg)							r							r	c	c
Kionoceras angulatum var. deflectostriatum n. var.														rr		
Kionoceras latouri n. sp.					rr									rr	rr	
Kionoceras granosistriatum n. sp.	rr[1]															
Thoracoceras erro n. sp.															rr	
Cyrtorizoceras breviradiatum n. sp.	rr															
Trilobita																
Calymene tuberculata (Brünnich)	rr[1]															
Calymene tuberculosa (Dalman)		rr?		rr												
Calymene intermedia var. antigonishensis n. var.									rr?		r		r	c	c	c
Homalonotus knighti Koenig								rr	rr	rr	c					
Homalonotus dawsoni Hall														r	cc	
Dalmanitina logani (Hall)													r	r	cc	
Dalmanitina logani var. conservatrix McLearn											rr		r	r	r	
Dalmanites weaveri (Salter)						c	c									
Dalmanites sp.								rr								
Phacops (Portlockia) marklandensis McLearn				rr												
Ostracoda																
Leperditia sinuata Hall													rr	r	c	
Ctenobolbina? sp.															rr	
Beyrichia equilatera Hall									rr				rr		r	rr
Beyrichia tuberculata (Kloeden)													rr	r	cc	r
Kloedenia sp.													rr	rr	c	

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[1] Probably from the Stonehouse.

CORRELATION

The best comparisons of the Arisaig faunas are with those of the British sections. This is due not only to the former presence of connecting seaways between the two regions, but also to the somewhat similar conditions of sedimentation that prevailed in the British seas at times, especially in the later Silurian. With the limestone faunas of Christiania and other north European localities correlations are more difficult, but, nevertheless, the relations can be worked out to a considerable degree. Nearer home, the most reliable comparisons can be made with the faunas of the adjacent and similar muddy seas of southern Maine. In interior North America the best comparisons can be made with the faunas of eastern New York and the Cumberland trough.

ANTICOSTI, QUEBEC[1]

On the basis of having the following fossils in common, the Arisaig Ross Brook formation is correlated with the lower part of the Jupiter formation: *Monograptus clintonensis* (Hall), *Plagiorhyncha decemplicata* (Sowerby), and *Coelospira hemispherica* (Sowerby). Further correlation with Anticosti is not advisable at present.

CHALEUR BAY, QUEBEC

Correlation with the Silurian Chaleur Bay faunas is difficult. The Chaleur Bay faunas differ from those of Arisaig in biologic associations and are of the Anticosti province.

NORTHERN MAINE

In Aroostook county, Maine, the Sheridan and Ashland faunas, as identified by H. S. Williams,[2] have a few components which indicate affinity with the Ross Brook; but, owing to the admixture of Lower Helderberg species in the lists, and especially in those of the Ashland limestone, it would be unwise to attempt a correlation at present. In 1900 Williams correlated the Chapman sandstone with the terminal beds of Arisaig (Stonehouse), but recently he and Breger[3] revised this interpretation and recognized the Lower Devonian age of the Chapman fauna. It is sufficient to say that the two faunas have no chronological affinity whatever, and that the meagre resemblances are in long-ranging forms.

EASTPORT, MAINE

Of the Silurian faunas of Maine, those of the Eastport quadrangle have received the most attention, and have been described by H. S. Williams.[4] Faunal lists are given by Bastin and Williams.[5] The basal formation is the Quoddy shale in which fossils are rare and poorly preserved. Of 9 species, 5 occur also at Arisaig or are represented there by closely related species: *Leptaena rhomboidalis* (Wilckens), *Schuchertella subplana* (Conrad), *Dalmanella* cf. *elegantula* (Dalman), *Delthyris crispa* (Hisinger), and *Atrypa reticularis* (Linnaeus). On the basis of the second last species this formation is correlated with the McAdam.

The Dennys formation has a small fauna of 15 species, which apparently is not well preserved. Only one species, *D. crispa*, is in common with Arisaig. The Dennys is correlated with the McAdam and possibly a part of the Moydart.

The Edmunds formation has a fauna of 23 species of which only 6 occur at Arisaig or are represented there by related species. There is evidence, although not conclusive, that the Edmunds fauna is to some extent intermediate in time between the faunas of zone a of the Moydart and of the Stonehouse. The Edmunds has affinities with both the Moydart and Stonehouse:

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[1] Twenhofel, W. H., Geol. Surv., Can., Mus. Bull. 3, 1914, 35 pp., 1 plate. *See also* Geol. Surv., Can., Int. Geol. Cong., Guide Book No. 1, pt. 2, p. 308.

[2] Williams, H. S., "The Palæozoic faunas of Maine," Bull. U.S. Geol. Surv., 165, 1900, pt. 1, pp. 47-54.

[3] Williams, H. S., assisted by Breger, C. L., Prof. Paper, U.S. Geol. Surv., 89, 1916, p. 297.

[4] Williams, H. S., Proc. U.S. Nat. Mus., 42, 1912, pp. 381-398, Pls. 49, 50; Proc. U.S. Nat. Mus., 45, 1913, pp. 319-352, Pls. 29-31; Proc. U.S. Nat. Mus., 51, 1916, pp. 73-80, Pl. 1.

[5] Bastin, E. S., and Williams, H. S., U.S. Geol. Surv., Folio 192, 1914, p. 9.

the Edmunds *Chonetes cobscooki* H. S. Williams and *C. edmundsi* H. S. Williams resemble the dwarfed *C. novascoticus* of zone a and part of zone b of the Stonehouse; *Palaeopecten danbyi* (McCoy) is in both the Edmunds and Stonehouse; *Wilsonia wilsoni* var. *saffordi* (Hall) is common to the Edmunds and Moydart. Two Edmunds species of *Delthyris* are intermediate in development between the Moydart *Delthyris crispa* mut. *moydartensis* n. mut., and the early Stonehouse *Delthyris rugaecosta* mut. *prima* n. mut.: the Edmunds *D. trescotti* (H. S. Williams) is near *D. rugaecosta prima*, but its cardinal area is by no means so high and flat; the Edmunds *D. cobscooki* has the high, flat, cardinal area of *D. rugaecosta prima*, but lacks the median septum and in this respect resembles *D. crispa moydartensis*. The existence of a fauna at Eastport, Maine, intermediate in age between those of the Stonehouse and of zone a of the Moydart at Arisaig, does not necessarily imply a break in the Arisaig section; for zone b of the Moydart is unfossiliferous and the Edmunds may, in part at least, be equivalent in age to this part of the Arisaig section.

The Pembroke affords better comparison with Arisaig. Of the 26 species of this formation 12 are also in the Stonehouse or represented there by closely related species. The following are of value:

Pembroke Formation	*Stonehouse Formation*
Chonetes bastini H. S. Williams	*C. novascoticus* Hall, large species of upper zones
Dalmanella lunata (Sowerby)	*D. lunata*
Grammysia triangulata (Salter)	*G. triangulata*
Lingula minima var. *americana* H. S. Williams	*L. minima*
Modiolopsis leightoni H. S. Williams	*M. exilis* Billings
M. leightoni var. *quadrata* H. S. Williams	
Palaeopecten danbyi (McCoy)	*P. danbyi*

Thus the correlation of the Pembroke with the Stonehouse rests on good evidence.

The fauna of the Eastport formation has nothing in common with the Arisaig faunas.

ENGLAND, WALES, AND SOUTHERN SCOTLAND

The Beechhill fauna has the following species identical with, or closely related to, Lower Valentian species: *Schizophorella arisaigensis* n.sp., *Leptaena rhomboidalis* (Wilckens), *Whitfieldella? crassa* var. *beechhillensis* n. var., and *W.? cf. angustifrons* (McCoy). The first resembles *Schizophorella mullochensis* (Davidson), which is common in the Lower Valentian. The presence of a variety of *W.? crassa* (Sowerby) is of greater diagnostic importance. The single specimen of *W.?* cf. *angustifrons* (McCoy) also suggests a Lower Llandovery (Lower Valentian) age, but this species has been reported also from the Upper Llandovery. The best reliance is to be placed on the presence of a *Whitfieldella* of the *W.? crassa* type, the absence of *C. hemispherica*, and to a less extent the absence of *P. decemplicata*.[1] Both cumulative and negative evidence, therefore, point to the correlation of this formation with the Lower Llandovery of Llandovery, etc., with the Haverford stage of Haverfordwest, and the Mulloch Hill and Saughhill groups of the Newlands[1] stage of Girvan, i.e. with the Lower Valentian of Great Britain.

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[1] One poor specimen is reported from the Lower Valentian of Mulloch Hill by Reed. Is this a *Plagiorhyncha* or a *Camarotoechia* with two ribs in the median fold like the Beechhill *C. bimesiornata*? The identification of *P. decemplicata* in the Haverford rocks is questioned in the Haverford memoir. Unquestioned identifications in the literature are from the Upper Valentian. Indeed in the Milford memoir this species is used in the identification of the Upper Valentian.

The Ross Brook is correlated with the remainder of the Valentian. This includes the Upper Llandovery of Shropshire, Gloucestershire (May Hill), etc., the Millin stage of Haverfordwest, and the Camregan and Penkhill groups of the Dailly[2] stage of Girvan. This correlation is based on the following species in common: *Plagiorhyncha decemplicata* (Sowerby), *Coelospira hemispherica* (Sowerby), and *Dalmanites weaveri* (Salter). The following Ross Brook form is closely related to a British species that goes no higher than the Valentian, *Camarotoechia llandoveriana* var. *rossonia* n. var.

The McAdam has the following in common with the Salopian; some are long ranging and others make their first appearnace both in the McAdam and in the Wenlock or Lower Salopian: *Serpulites longissimus* Murchison, *Cornulites serpularis* Schlotheim, *Leptaena rhomboidalis* (Wilckens), *Camarotoechia nucula* var. *planorugosa* n. var., *Atrypa reticularis* (Linnaeus), *Delthyris crispa* (Hisinger), *Nuculites cawdori* (Sowerby), *Plectonotus trilobatus* (Sowerby), *Diaphorostoma cornutum* var. *arisaigense* n. var., and *Homalonotus knighti* (Koenig). These species do not admit of any exact correlation and indicate nothing more than Salopian. The presence of the Lower Ludlow graptolite, *Monograptus wandalensis* Watney and Welch,[3] in the upper part of zone c of the McAdam, indicates that the uppermost McAdam is Lower Ludlow or fairly high Salopian. The McAdam is, therefore, correlated with the Woolhope, Wenlock, and a part of the Lower Ludlow. It is to be noted that there is at Arisaig in the McAdam no *Chonetes* of the *C. striatellus* type and no *Wilsonia.* In England and Wales these come early in the Salopian. However, the belated appearance of *Wilsonia* at Arisaig appears to be due to the unfavourable bottom habitats of the McAdam seas.

C. striatellus and *Wilsonia wilsoni* are represented in the Moydart by *C. novascoticus* and *W. wilsoni* var. *saffordi* (Hall). The Moydart fauna is Salopian, but there is nothing in it to indicate whether it is related to the Wenlock or Lower Ludlow. As the highest McAdam is Lower Ludlow, however, then the Moydart must be high Lower Ludlow, i.e., very high Salopian. The species identical with or closely related to Salopian forms are given below. They are nearly all long ranging, but some do not go below the Wenlock: *Serpulites longissimus* Murchison, *Cornulites serpularius* Schlotheim, *Lingula lewisi* Sowerby, *Chonetes novascoticus* Hall, *Camarotoechia nucula* var. *planorugosa* n. var., *C. squamifera* n.sp., *Wilsonia wilsoni* var. *saffordi* (Hall), *Delthyris crispa* var. *moydartensis* n. var., *Rhynchospira salteri* var. *acadiae* (Hall), *Grammysia cingulata* mut. *intermedia* n. mut., *Diaphorostoma cornutum* var. *arisaigense* n. var., *Orthoceras ludense* var. *camerini* n. var., *O. bullatum* var. *pictouense* Dawson, and *Homalonotus knighti* (Koenig).

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[1] Newlands as defined by O. T. Jones, Quart. Jour. Geol. Soc., Lond., 77, p. 154.

[2] Dailly as defined by O. T. Jones, Quart. Jour. Geol. Soc., Lond., 77, p. 154.

[3] Identified by Dr. Gertrude L. Elles.

The British Upper Ludlow formation and the Arisaig Stonehouse formation have in common a number of short-ranging species which makes the correlation of these two formations a very decisive one. The species are: *Urasterella ruthveni* var. *arisaigensis* Ruedemann (cf. *U. ruthveni* (Forbes), *Dalmanella lunata* (Sowerby), *D. orbicularis* (Sowerby), *Brachyprion gilpini* (Dawson) (cf. *B. ornatella* (Salter)), *Grammysia triangulata* (Salter), *G. obliqua* (McCoy), and *Orthonota angulifera* (McCoy).

CHRISTIANIA[1]

The Ross Brook fauna has the following species in common with the faunas of the Christiania region or closely related to Christiania forms: *Cornulites serpularius* Schlotheim, *Dalmanella wisbyensis* var. *nana* n. var., *Leptaena rhomboidalis* (Wilckens), *Schuchertella pecten* (Linnaeus), *Atrypa reticularis* (Linnaeus), *Coelospira hemispherica* (Sowerby), *Plagiorhyncha glassi* (Davidson), *P. decemplicata* (Sowerby), and *Calymene tuberculosa* Dalman. The short-ranging components of the above list point to a correlation of the Ross Brook with the whole of etage 6 and possibly a part of etage 7.

The McAdam has the following Christiania species: *Cornulites serpularius* Schlotheim, *Leptaena rhomboidalis* (Wilckens), *Atrypa reticularis* (Linnaeus), *Delthyris crispa* (Hisinger), and *Diaphorostoma cornutum* var. *arisaigense* n. var. The above list indicates very little, but the presence of *D. crispa* in the top zone of the McAdam points to a correlation with parts of etages 7 and 8 of the Christiania section.

The Moydart has the following components which resemble Christiania species: *Cornulites serpularius* Schlotheim, *Chonetes novascoticus* Hall, *Wilsonia wilsoni* var. *saffordi* (Hall), *Delthyris crispa* mut. *moydartensis* n. mut., *Rhynchospira salteri* var. *acadiae* (Hall), *Grammysia cingulata* mut. *intermedia* n. mut., *Diaphorostoma cornutum* var. *arisaigense* n. var., *Orthoceras ludense* var. *camerini* n. var. The presence of *Wilsonia* and *Chonetes* of the *C. striatellus* type correlates this fauna with high etage 8 and low etage 9 of the Christiania region. However, it should be noted that these forms are somewhat late in appearance in the Christiania succession as compared with their advent in the British faunas.

The following Stonehouse species are either in Christiania faunas or represented there by closely related species: *Cornulites serpularius* Schlotheim, *Leptaena rhomboidalis* Wilckens, *Schuchertella pecten* (Linnaeus), *Chonetes novascoticus* Hall, *Atrypa reticularis* (Linnaeus), *Diaphorostoma cornutum* var. *arisaigense* n. var. These species indicate little. The absence of *D. crispa* and presence of a *Delthyris* of the *D. elevata* type may have some significance. *D. crispa* becomes extinct in 9d and *D. elevata* ranges from 9e to 9g. This evidence, as far as it goes, places the Stonehouse as high as etage 9e to etage 9g in the Christiania region.

ESTHONIA, RUSSIA

The Silurian of Esthonia has been studied by Twenhofel.[2] The earlier Tamsal and Addifer formations share no diagnostic fossils with Arisaig. As, however, Twenhofel[3] has compared them with the Gun

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[1] Kiaer, Joh., Das Obersilur in Kristianiagebiete, Kristiania, 1908.
[2] Twenhofel, W. H., Bull. Mus. Comp. Zool., 56, No. 4, 1916, pp. 289-340.
[3] Op. cit., pp. 337-338.

River and Jupiter formations of Anticosti, they may be equivalent to the Ross Brook and even the base of the McAdam. With the succeeding Johannis formation a better correlation is possible. The appearance there of *Delthyris crispa* and *Wilsonia wilsoni* indicates affinity with the McAdam and Moydart. The absence of *D. crispa* in the terminal Oesel formation and the entrance there of *Delthyris* of the *D. elevata* type and of *Palaeopecten danbyi* (McCoy) suggest comparison with the Stonehouse.

INTERIOR NORTH AMERICA

The Arisaig Ross Brook formation is correlated with that part of the Rochester, N. Y., section[1] between the Maplewood and Williamson members inclusive, i.e., the equivalent of Clinton as defined by Chadwick in 1908[2] and Schuchert in 1910.[3] This is not the Clinton of Ulrich and Bassler or of Chadwick's 1918 paper[4]. The correlation is based on the following Ross Brook species: *Retiolites geinitzianus* mut. *venosus* (Hall), *Monograptus clintonensis* (Hall), *Coelospira hemispherica* (Sowerby), and *Camarotoechia llandoveriana* var. *rossonia* n. var. The first two are in the Williamson. The third[5] is in the Sodus and Furnaceville and the last is very similar to *Camarotoechia aequiradiata* (Hall) from the Sauquoit beds. The Beechhill is difficult to compare with American faunas. Only the following components are important: *Liospira* cf. *affinis* Foerste and *Cyclonema parvimedium* n.sp. *Liospira affinis* Foerste is reported from the Brassfield of Ohio, and the Edgewood of Illinois. The Arisaig form, however, has little value in correlation, for it ranges up into the McAdam. *Cyclonema parvimedium* n.sp. is thought to have some significance, for it belongs to a group of the genus that flourished in the Ordovician and which in the Silurian is only elsewhere represented by *C. daytonense* Foerste in the Edgewood of Illinois and Cataract of Ontario. The absence of *C. hemispherica* and *Atrypa reticularis* (Linnaeus) also suggests a pre-Clinton or at least a pre-Furnaceville age. But in a fauna of 14 species too much reliance should not be laid on negative evidence. Moreover, the absence of the fairly widespread *Coelospira planoconvexa* (Hall) does not strengthen the correlation with the Cataract. The evidence tends to place this fauna downward, but does not establish its equivalence to the Cataract or Albion.

The following McAdam species are of importance in correlation with the Niagaran: *Pectorhyncha obtusiplicata* (Hall) and *Delthyris crispa* (Hisinger). The first is found in the Rochester shale and the second makes its first appearance in the Irondequoit limestone. The McAdam, therefore, is correlated with the Irondequoit and Rochester.

The following Moydart species afford comparison with the Niagaran: *Chonetes novascoticus* (Hall), *Wilsonia wilsoni* var. *saffordi* (Hall), and *Delthyris crispa* mut. *moydartensis* n. mut. The first is represented by a variety in the Waldron. *Wilsonia* is belated in appearance in the Niagaran and does not enter until Louisville time and is also found in the Brownsport. *D. crispa* is in the Waldron and the variety *simplex* ranges from the Waldron to the Louisville. The Guelph form is transitional to the Cayugan species *D. eriensis* Grabau. Considering the above and also the extinction of the Rochester *C.* (*Pectorhyncha*) *obtusiplicata*, the Moydart is probably as late as Lower Lockport or Upper Niagaran at least. Whether or not it extends to the end of the Niagaran cannot be said.

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[1] Chadwick, G. H., Bull. G.S.A., 29, 1918, p. 329.
[2] Chadwick, G. H., Science, n. ser., 28, 1908, p. 347.
[3] Schuchert, Chas., Bull. Geol. Soc. Am., 20, 1910, p. 533.
[4] Chadwick, G. H., Bull. G.S.A., 29, 1918, pp. 327-368. *See* "allowable usage," p. 364.
[5] The New York form is identified as *Coelospira nitens* (Vanuxem) by Chadwick.

The fauna of the Stonehouse does not admit of comparison with those of the Niagaran, for there is hardly anything in common. *Delthyris* in the interior follows an entirely different course of evolution as compared with Arisaig, and no comparison can be made on this basis. The large size, and the reduced number, of plications in *Eospirifer stonehousensis* n.sp., foreshadow the Lower Helderberg *E. macropleura* (Conrad) and tend to place the Stonehouse fauna high in the Silurian.

Correlation Table

	Anticosti	Interior N. America	Eastport, Maine	Arisaig	Great Britain	
Silurian	Chicotte	L. Munroe-Greenfield	Eastport			
		Salina Guelph Louisville Lockport	Pembroke	Stonehouse	Upper Ludlow	
		Waldron	Edmunds	Moydart	Aymestry	Salopian
	Jupiter	Rochester	Dennys		Lower Ludlow	
		Irondequoit	Quoddy	McAdam	Wenlock	
					Woolhope	
		Williamson Sodus Reynales Furnaceville Bear Creek Maplewood		Ross Brook	U. Llandovery-Millin-Dailly[1]	U. Valentian
	Gun River Becsie	Cataract-Brassfield		Beechhill	L. Llandovery-Haverford-Newlands[2]	L. Valentian

[1],[2] Dailiy and Newlands as defined by O. T. Jones, Quart. Jour. Geol. Soc., London, 77, p. 154.

RELATION TO DEVONIAN OF INTERIOR NORTH AMERICA

The Atlantic derivation of the Lower Helderberg and Hamilton faunas has long been recognized. As they are in part shale faunas and to some extent of the marginal sea, it is not surprising that they show some resemblance to the Arisaig faunas, which are also of the Atlantic realm and of the marginal sea. *Schizocrania* of the Devonian type, i.e. having radiating striæ on the pedicle valve and a modified pedicle notch, was already in existence in Silurian time, and a species found its way into the Arisaig sea as early as Ross Brook time. The *Eatonia* group was present in the Silurian and in the Arisaig sea of the McAdam and Moydart epochs;

it had achieved the typical *Eatonia*-like form and the large, excavated muscle scars of the ventral valve, but not the high cardinal process of crural origin. *Grammysia* of the *cingulata* group, having sulci and ridges radiating from the umbo to the mid-basal margin, so common in the Devonian, was already present in the North Atlantic Silurian and was represented at Arisaig in the McAdam, Moydart, and Stonehouse seas. The peculiar prowed *Nuculaceæ* of the genus *Tancrediopsis* were at Arisaig in Ross Brook and McAdam time and were in the Silurian of eastern Pennsylvania; they occur also in the interior North American Devonian faunas of Atlantic origin. Moderately convex *Nuculites* of the Devonian *N. oblongatus* type was in the Silurian and represented at Arisaig from McAdam to Stonehouse time. *Nuculites* having a convex and modified post-umbonal slope, of the *N. cuneiformis* type, was also in the Silurian and had a long range at Arisaig. *Goniophora* with radiating striæ, i.e. *Cosmogoniophora,* was in the Silurian as well as the Devonian, being represented in the last Arisaig fauna. The line of *Orthonota,* in which the anterior costæ remain parallel to the growth lines, was represented at Arisaig in McAdam time and is represented in Devonian faunas by *Orthonota undulata* and *O. carinata.* The unornamented, so-called *Orthonota* shells of the *pressiornata* group passed on into the Devonian. The peculiar bivalve genus *Paracyclas* was in both Silurian and Devonian faunas of Atlantic origin.

Among the groups of mud-loving Silurian bivalves, which, as far as known, do not pass on into the Devonian are: the McAdam genus *Honeymania;* the McAdam and Stonehouse genus *Arisaigia;* the Stonehouse genus *Tropinuculites;* the Stonehouse *Orthonota* forms of the type of *O. venusta* and *O. angulifera,* in which the anterior costæ obliquely cross the growth lines; and the Stonehouse group of *O? incerta.*

PALÆOGEOGRAPHIC RELATIONS

The Beechhill fauna has three species of interior American kinship:

Lingula clintoni Vanuxem
Liospira cf. *affinis* (Foerste)
Cyclonema parvimedium n. sp.

The following show kinship with northwest Europe:

Schizophorella arisaigensis n. sp.
Whitfieldella? crassa var. *beechhillensis* n. var.
W.? cf. *angustifrons* (McCoy)

The affinity of the Ross Brook fauna with those of interior America, especially the eastern part, is shown by a number of species:

Retiolites geinitzianus mut. *venosus* (Hall)
Monograptus clintonensis (Hall)
Lingula clintoni Vanuxem
L. subacutirostris n. sp.
L. taeniola Hall and Clarke
Chonetes tenuistriatus Hall
Pterinea emacerata var. *arisaigensis* n. var.

On the other hand, the following species indicate relationship with the North European faunas:

Serpulites longissimus Murchison
Dalmanella wisbyensis var. *nana* n. var.
Plagiorhyncha glassi (Davidson)
Hyolithes forbesi (Sharpe)
Kionoceras angulatum (Wahlenberg)
Calymene tuberculosa (Dalman)
Dalmanites weaveri (Salter)

Other Ross Brook species are found in both American and North European faunas or are represented by similar forms:

Camarotoechia llandoveriana var. *rossonia* n. var.
Plagiorhyncha decemplicata (Sowerby)
Coelospira hemispherica (Sowerby)

P. decemplicata is reported by Foerste[1] from Cumberland Gap, Tennessee.

The relations of the McAdam are similar to those of the Ross Brook. The following components have American affinities:

Chonetes tenuistriatus Hall
Pectorhyncha obtusiplicata (Hall)
Arisaigia postornata McLearn

Outside of Arisaig the new genus *Arisaigia* is known only in Mifflin county, Pennsylvania, where Simpson[2] has described a species from the McKee's ore bank. The following McAdam species are in the northwestern European Silurian:

Monograptus wandalensis Watney and Welch
Nuculites cawdori (Sowerby)
Hyolithes forbesi (Sharpe)
Homalonotus knighti (Koenig)

No Moydart species are confined to Arisaig and interior North America. The following Moydart species are represented by closely related species in interior North America and also in northwest Europe; they are, however, widely spread types and do not necessarily indicate affinity with interior America:

Chonetes novascoticus Hall
Wilsonia wilsoni var. *saffordi* (Hall)
Delthyris crispa mut. *moydartensis* n. mut.

The following Moydart species are in northwest Europe or are very similar to species there; they show the transatlantic kinship of the Moydart fauna:

Serpulites longissimus Sowerby
Cornulites serpularius Schlotheim
Lingula lewisi Sowerby
Rhynchospira salteri var. *acadiæ* (Hall)
Grammysia cingulata mut. *intermedia* n. mut.
Pteronitella venusta var. *oblonga* (Billings)
Seelya moydartensis n. sp.
Hyolithes forbesi (Sharpe)
Orthoceras ludense var. *camerini* n. var.
O. bullatum var. *pictouense* (Dawson)·
Homalonotus knighti Koenig

The Stonehouse contains only 4 species in common with interior North American faunas:

Lingula taeniola Hall and Clarke
Leptaena rhomboidalis (Wilckens)
Schuchertella pecten (Linnaeus)
Atrypa reticularis (Linnaeus)

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[1] Foerste, A. F., Proc. Bost. Soc. Nat. Hist., 24, 1890, p. 320.
[2] Simpson, G. B., Trans. Am. Phil. Soc., n. ser., 16, 1890, p. 451.

The last three are widely-spread species and are no indication of kinship of faunas. The first species is not known in the post-Clinton of interior North America. On the other hand the following Stonehouse species show the close resemblance of the Stonehouse fauna to those of northwest Europe:

Serpulites longissimus Sowerby
Cornulites serpularius Schlotheim
Urasterella ruthveni var. *arisaigensis* Ruedemann
Lingula minima Sowerby
L. lewisi Sowerby
Dalmanella lunata (Sowerby)
D. orbicularis (Sowerby)
Brachyprion gilpini (Dawson) cf. *B. ornatella* (Salter)
Delthyris rugaecosta (Hall) cf. *Delthyris elevata* (Dalman)
Rhynchospira salteri var. *acadiæ* (Hall)
Grammysia triangulata (Salter)
G. obliqua (McCoy)
Nuculites cawdori (Sowerby)
Palaeopecten danbyi (McCoy)
Pteronitella venusta var. *oblonga* (Billings)
Orthonota angulifera (McCoy)
Plectonotus trilobatus (Sowerby)
Hyolithes forbesi (Sharpe)
Dawsonoceras elegantulum (Dawson)
Kionoceras angulatum (Wahlenburg)
Homalonotus dawsoni Hall

The generalization can now be made that the alliances of the earlier Arisaig Silurian faunas are with both northwestern Europe and certain parts of interior America, and that those of the later faunas are with northwestern Europe only. Up to the end of McAdam time there were faunal connexions with eastern New York and the Cumberland basin. To the west, affinity is shown only with western New York and not at all with Ohio, Indiana, and Kentucky. In Moydart and Stonehouse time all former connexions with interior America appear to have been broken off, for the faunas show relationship with northwestern Europe only.

The affinities of the Eastport Maine faunas, like those of Arisaig, are with the British faunas. Eastport is only about 240 miles from Arisaig. It is, therefore, peculiar that the two localities do not have more species in common. The Quoddy and Dennys faunas are too small to base conclusions on. The paucity of Edmunds species in common with Arisaig can probably be explained by the age of the Edmunds fauna, which does not appear to be equivalent in time to any Arisaig fauna. The Pembroke is the largest Eastport fauna and is coeval with the Stonehouse. Of the 26 Pembroke species, 5 are also at Arisaig, but they are widespread species. Nine are very close to Stonehouse species. The paucity of common species is explained in part by the absence of the calcareous sand bottom in the Pembroke sea. But both the Arisaig and Pembroke seas had mud bottoms, and unless elements of the bottom environment, other than the material of the bottom, were unlike, it is necessary to infer some kind of a barrier that prevented a more free intermingling of species.

PART II

SYSTEMATIC DESCRIPTIONS

Phylum, **COELENTERATA**

Class, *Anthozoa*=*Actinozoa*
Subclass, TETRACORALLA Haeckel
Family, ZAPHRENTIDAE Milne Edwards and Haime
Genus, *Heliophrentis* Grabau

1910. *Heliophrentis* Grabau, Mich. Geol. and Biol. Surv., Pub. 2, geol. ser. 1, p. 98.

Conical to somewhat cylindrical corals, having the "septal arrangement of *Zaphrentis*" and "the carinæ of *Heliophyllum*." Carinæ variably developed. Septa "alternating, the longer reaching the centre." "Fossula present in specialized species." Genotype, *Heliophrentis alternata* Grabau.

The Arisaig specimens agree with the above generic description, but have also a false columella. This is formed by the projection of the ends of the longer septa above the floor of the calice. In sections cut across the body of the coral very little twisting of the ends of the septa at the centre is seen; some specimens show deposition of sclerenchyma there. In some species of *Heliophrentis* the ends of the septa are slightly twisted, but the floor of the calice is described as being flat. No tabulæ or dissepiments are observed in the Arisaig specimens, but this may be due to lack of preservation; none have been described for *Heliophrentis*. Miss O'Connell[1] has recently pointed out that the genotype of *Zaphrentis* Raf. and Clifford bears carinæ and that *Heliophrentis* Grabau may be synonymous; she does not reject *Heliophrentis*, however.

Heliophrentis bilateralis var. *beechhillensis* n. var.

Plate I, figures 1 to 3

Compared with specimens[2] of *Heliophrentis bilateralis* (Hall)[3] from the Cataract formation of Ontario, etc., the Arisaig ones have much in common. They are short and turbinate. They have a deep calice, somewhat rugose exterior, and vertical lowly convex ridges on the exterior corresponding to the interseptal loci of the interior. In the body of the coral, below the floor of the calice, there are 35 to 40 long septa, produced to the centre. On the margin of the calice additional shorter septa are introduced alternately between the longer ones, making 70 to 80 in all; these are strong above and die out at the level of the floor of the calice or a little below. All the septa are carinated near the apertural margin of the calice. A low, broad, false columella is formed by the projection of the ends of the septa above the floor of the calice. This is well preserved in moulds of the calice. Sections across the body of the coral, however, show very little twisting of the ends of the septa, although some show a tendency to deposit sclerenchyma. In the Cataract specimens there is no false columella projecting above the floor of the calice, but sections cut below the calice are similar to those of the Arisaig specimens. The Arisaig variety has a deep fossula which is not preserved in any of the Cataract specimens. It has no dissepiments or tabulæ, whereas the Cataract specimens do have them, but they are obscure and difficult to demonstrate. The Arisaig variety is on the average larger than the Cataract species and the calice is less shallow. The dimensions of a representative Arisaig specimen are:

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[1] Annals N.Y. Acad. Sci., 23, 1914, pp. 177-192.
[2] In Peabody Museum of Yale University.
[3] Pal. N.Y., 2, 1852, p. 41, Pl. 17, figs. 3a to h; p. 113, Pl. 32, figs. 3a to c.

	mm.
Length	33
Diameter	24
Depth of calice	13
Diameter floor calice	11
Height of false columella	3

Lindstromia subduplicata var. *crenulata* (McCoy)[1] from the Lower Llandovery of Girvan and the Llandovery of Wales has the same form, deep calice, alternating long and short septa, the latter dying out below, and the carinated septa. It has, however, a very prominent and greatly produced false columella, much strengthened by the deposit of secondary sclerenchyma. It has no fossula.

Horizon and Locality. Common in the Beechhill formation, Beechhill cove, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 6004; paratypes, Cat. Nos. 6005, 6006.

Subclass, TABULATA Milne Edwards and Haime

Family, FAVOSITIDAE Milne Edwards and Haime

Genus, *Favosites* Lamarck

1812. *Favosites* Lamarck, Cours. de Zool. du Mus. Hist. Nat., Hist. An. Sans Vert., 1812, p. 204.
1852. *Favosites* Hall, Pal. N.Y., 2, p. 124.
1854. *Favosites* Edwards and Haime, Mon. Brit. Foss. Corals, Pal. Soc., p. lx.
1876. *Favosites* Rominger, Geol. Surv., Mich., 3, pt. 2, p. 19.
1899. *Favosites* Lambe, Cont. Can. Pal., Geol. Surv., Can., 4, pt. 1, p. 2.
1913. *Favosites* Vaughan, Zittel Eastman Textb. Pal., 2d. ed., p. 113.

Massive or branching corallum; corallites prismatic, polygonal; tabulæ numerous; septa represented by rows of spines or vertical ridges; walls thin and pierced by mural pores, which are on the sides and not at the angles. Genotype, *Favosites alveolatus* Lamarck.

Favosites cf. *niagarensis* Hall

Plate I, figure 11

Compare with:

1852. *Favosites niagarensis* Hall, Pal. N.Y., 2, p. 125, Pl. 34a (bis), fig. 4a-i.

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[1] Mon. Sil. Foss. Girv. Dist., 1, p. 90, 1880, Pl. 6, fig. 2f.

1885. *Favosites niagarensis* Davis, Kentucky Fossil Corals, Geol. Surv., Kentucky, pt. 2, Pl. 8, figs. 3,4.
1889. *Favosites niagarensis* Lambe, Cont. Can. Pal., Geol. Surv., Can., 4, pt. 1, p. 7.
1915. *Favosites niagarensis* Bassler, Bull. U.S. Nat. Mus., 92, p. 533.

The only complete specimen is 35 mm. high and 50 mm. wide. The habit of growth is spheroidal. The corallites are polygonal and somewhat unequal; in one of the specimens they vary from 0·5 to 2 mm. in diameter and in the other from 0·5 to 3 mm. The tabulæ are flat and about 1·5 mm. apart. The walls of the corallites are finely rugose, not smooth, and are pierced by mural pores in one or two rows according to the width of the wall; where in a single row they lie along the centre of each wall and in double rows they alternate. Each mural pore is surrounded by a raised rim. The septal spines, if once present, are not preserved.

In size the corallites are closest to *Favosites niagarensis* Hall and smaller than in *F. gothlandicus* (Fought)[1]; they are larger than in *F. hisingeri* Edwards and Haime[2] and its allies *F. venustus* Hall,[3] *F. pyriformis* Hall,[4] and *F. parasiticus*[5] Hall. The polygonal corallite shows that it is not *F. forbesi* Edwards and Haime[6] or *F. cristatus* Edwards and Haime,[7] each of which has rounded corallites. The corallite of *F. parasiticus* is also somewhat rounded. The inequality in size is unlike *F. gothlandicus* and nearer *F. niagarensis.* The comparatively wide spacing of the tabulæ at once separates it from *F. hisingeri* and allied species, which have closely arranged tabulæ. In this character it is nearer *F. gothlandicus. F. niagarensis* has somewhat more closely set tabulæ. On the whole the Arisaig specimens resemble *F. niagarensis,* from which they differ chiefly in the somewhat wider spacing of the tabulæ.

Horizon and Locality. Very rare on Doctor brook, Arisaig, N.S., and probably from the Ross Brook formation.

Type. Victoria Memorial Museum; holotype, Cat. No. 6003.

Class, *GRAPTOLITOIDEA* Lapworth

Family, RETIOLITIDAE Lapworth

Genus, *Retiolites* Barrande

1850. *Gladiolites* Barrande, Grap. de Bohême, p. 68.
1850. *Retiolites* Barrande, Grap. de Bohême, p. 68 (footnote).
1908. *Retiolites* Elles and Wood, Mon. Brit. Grap., Pal. Soc., pp. 333-335.
1908. *Retiolites* Ruedemann, Mem. N.Y. State Mus., 11, pt. 2, pp. 467, 469.
1913. *Retiolites* Ruedemann, Zittel-Eastman Textb. Pal., 2d ed., p. 132.

Biserial, polypary straight; periderm consists of a meshwork of fibres covered with fine membrane. Genotype, *Retiolites geinitzianus* Barrande.

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[1] Mon. Brit. Foss. Corals, Pal. Soc., p. 256, Pl. 60, figs. 1, 1a.
[2] Mon. Brit. Foss. Corals, Pal. Soc., p. 259, Pl. 61, figs. 1, 1a, 1b.
[3] 20th Rept. N.Y. State Cab. Nat. Hist., 1868, p. 390.
[4] Pal. N.Y., 2, 1852, p. 123, Pl. 34A, figs. 1 a-e.
[5] Pal. N.Y., 2, 1852, p. 122, Pl. 34, fig. 2 a-i.
[6] Mon. Brit. Foss. Corals, Pal. Soc., p. 258, Pl. 60, figs. 2-2g.
[7] Mon. Brit. Foss. Corals, Pal. Soc., p. 260, Pl. 61, figs. 3, 3a.

Retiolites geinitzianus mut. *venosus* (Hall)

Plate I, figure 8

1852. *Graptolites venosus* Hall, Pal. N.Y., 2, 1852, p. 40, Pl. 17 A, figs. 2a-c.
1908. *Retiolites geinitzianus* var. *venosus* Ruedemann, Mem. N.Y. State Mus., 11, pt. 2, p. 469, Pl. 29, figs. 7, 8; Pl. 31, figs. 6-8, text figs. 449-455.
1915. *Retiolites geinitzianus* var. *venosus* Bassler, Bull. U.S. Nat. Mus., 92, p. 1105.

Ruedemann's Description, 1908. "Rhabdosome file-shaped, with rounded sicular extremity (0·5 mm. wide), whence it grows very regularly and gradually in a length of 23 mm. to a width of 3 mm. to 3·5 mm. From that point its margins remain subparallel . . . the longest fragment seen measured 34 mm. The sicula has not been observed; the thecæ, as indicated by the parietal ledges, number 10 to 14 in 10 mm. They are inclined at an angle of 50 degrees, their apertures are rectangular, and approximately parallel to the axis of the rhabdosome; their lateral margins concave, the upper and lower margins convex and much thickened. The nemacaulus has not been observed."

Ruedemann considers this merely a variety of the European form. It is not so wide as the latter, which, according to Elles and Wood[1], attains a breadth of 5 mm. The Arisaig specimens are about 4 mm. wide.

Horizon and Locality. Common in zone d and very rare in zone e of the Ross Brook formation, coast section, Arisaig, N.S. It is also found in beds of Clinton age in the gorge of Genesee river, near Rochester, N.Y., etc. *Retiolites geinitzianus* Barrande occurs in the Gala-Tarannon and Lower Wenlock shale of Great Britain.

Type. Peabody Museum, Yale University; plesiotype, Cat. No. 401.

Family, MONOGRAPTIDAE Lapworth

Genus, *Monograptus* Geinitz

1852. *Monograptus* Geinitz, Die Graptolithen, p. 32.
1908. *Monograptus* Ruedemann, Mem. N.Y. State Mus., 11, pt. 2, p. 449.
1911. *Monograptus* Elles and Wood, Mon. Brit. Grap., pt. 8, Pal. Soc., p. 359.
1913. *Monograptus* Ruedemann, Zittel-Eastman Textb. Pal., 2d ed., p. 132.

Uniserial, unbranched Graptolitoidea; straight, curved, or spirally coiled rhabdosomes. Genotype, *Lomatoceras priodon* Bronn.

Monograptus clintonensis (Hall)

Plate I, figures 4 to 6

1843. *Graptolithus clintonensis* Hall, Geol. N.Y., 4th Dist., pp. 72, 74, fig. 12.
1852. *Graptolithus clintonensis* Hall, Pal. N.Y., 2, p. 39, Pl. 17 A, fig. 1.

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[1] Mon. Brit. Grap., pt. 7, Pal. Soc., 1908, p. 336, Pl. 34, figs. 8 a-d, text figs. 220 a-f.

1852. *Monograptus clintonensis* Geinitz, Die Graptolithen, p. 58.
1880. *Monograptus clintonensis* Lapworth, Geol. Mag., 7, p. 68.
1892. *Monograptus clintonensis* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 187.
1908. *Monograptus clintonensis* Ruedemann, Mem. N.Y. State Mus., 11, pt. 2, p. 450, Pl. 29, fig. 1, text figs. 425-431.
1915. *Monograptus clintonensis* Bassler, Bull. U.S. Nat. Mus., 92, p. 823.

Ruedemann's Description, 1908. "Rhabdosome obviously very long; very slender and nearly straight, with a short, slight curvature of the sicular end. Width at sicular extremity 0·3 mm.; that of mature parts 2 mm. Sicula small (1·5 mm.) and slender; furnished with an apertural spine. First theca originating at beginning of last third of sicula and becoming reversed in direction opposite the aperture of the sicula. Early thecæ adhering for two-thirds of their length to the common canal, projecting horizontally with their last third and bending slightly in sicular direction with their apertural portion; numbering 11 to 12 in 10 mm.; their apertures furnished with a short, stout, horizontal apertural mucro; those of the adult parts overlapping two-thirds of their length, inclined at an angle of 30 degrees, numbering 9 to 10 in 10 mm.; their free, apertural portion sharply recurved so as to become parallel to the axis of the rhabdosome and contracted towards the aperture; the latter horizontal, occupying but one-fifth the width of the rhabdosome."

The rhabdosome expands much more gradually and the width of the mature portion is much less than in the Wenlock specimens of *Monograptus priodon* Bronn.[1] The width of the Tarannon forms of that species is intermediate between the Wenlock specimens of the species and *M. clintonensis*, and figures of specimens from the Gala beds indicate that this is also true of the relative expansion. Ruedemann[2] notes that the proximal thecæ of *M. clintonensis* (Hall) have apertural spines which are not present in *M. priodon.* At Arisaig there are a couple of specimens that have a more rapid expansion than specimens of the normal species and these may be more closely related to *M. priodon.*

Horizon and Locality. Common in the Ross Brook formation, zones b to e, coast section, Arisaig, N.S. Found also in the Clinton of Sodus, Wayne co., banks of the Genesee at Rochester, and Palmer's glen near Rochester. This species has not been recognized in European faunas.

Types. Peabody Museum of Yale University; plesiotypes, Cat. Nos. 402, 403, 404.

Monograptus wandalensis Watney and Welch
Plate I, figure 7

1911. *Monograptus wandalensis* Watney and Welch, Quart. Jour. Geol. Soc. Lond., 67, 1911, p. 235, text fig. 4.

Original Description. "Polypary. Maximum length observed = 2·5 mm.; width at proximal extremity = 0·5 mm., increasing to a maximum of 1·5 mm. at the distal end. Curvature dorsal, variable in amount, in some specimens much marked at the proximal end.

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[1] Lethea Geognostica, I, p. 56, 1835, Pl. i, fig. 13.
[2] Mem. N.Y. State Mus., 11, pt. 2, p. 453.

"*Thecæ.* Thirteen in 1 cm.; inclined to the axis at an angle of 35 degrees. The thecæ show a tendency to narrow towards the aperture. Apertural margin concave. Overlap of thecæ a half to two-thirds of their length.

"This form may be readily distinguished from all other Ludlow graptolites by the marked dorsal curvature conspicuous throughout its length."

The identification of this species is by Dr. Gertrude L. Elles.

M. wandalensis is found at Wandale hill, England, in the zone of *M. nilssoni.*

Horizon and Locality. Common at one horizon near the top of zone c of the McAdam formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; plesiotype, Cat. No. 405.

Phylum, **VERMES**
Class, *CHAETOPODA*
Order, **Tubicola (Sedentaria)**
Genus, *Serpulites* Macleay

1839. *Serpulites* Macleay, Murchison's Sil. Syst., p. 700.
1855. *Serpulites* McCoy, Sedgewick and McCoy's Brit. Pal. Rocks and Fossils, p. 132.
1880. *Serpulites* Etheridge, Geol. Mag. (2), 7, p. 304.
1913. *Serpulites* Zittel-Eastman Textb. Pal., 2d ed., p. 139.
1916. *Serpulites* Ruedemann, Bull. N.Y. State Mus., 189, p. 85.

Calcareo-chitinous, slowly tapering and rather long tubes; they have an elliptical cross-section and are thickened by rod-like structures at the two extremities of the broad ellipse. In early growth stages adhere to foreign bodies by small adhesion disks. Chitinoid setæ have been observed near the aperture. (After Ruedemann.) Genotype, *Serpulites longissimus* Sowerby.

Serpulites longissimus Sowerby
Plate I, figure 12

1839. *Serpulites longissimus* Sowerby, Murchison's Sil. Syst., p. 608, Pl. 5, fig. 1.
1855. *Serpulites longissimus* McCoy, Sedgewick and McCoy's British Pal. Rocks and Fossils, p. 132.
1880. *Serpulites longissimus* Nicholson and Etheridge, Mon. Sil. Foss. Girvan Dist., III, p. 303, Pl. 20, figs. 12, 13.
1892. *Serpulites longissimus* var. Ami, Proc. and Trans. N.S. Inst. Sci., ser. 2, vol. 1, pt. 4, p. 411.
1915. *Serpulites longissimus* Bassler, Bull. U.S. Nat. Mus., 92, p. 1157.

Original Description. "Very long [tubes], hardly diminishing in diameter, compressed, smooth, slightly tortuous, composed of numerous thin layers of shell containing much animal matter."

McCoy's Description, 1855. "Subcompressed tube upwards of a foot long, gradually tapering at the rate of only two lines in 5 inches, forming part of a curve about one foot in diameter at the large end, but curving more rapidly towards the apex; surface with obtuse transverse undulations; shell thin, glossy, opaline; average diameter four lines, of thickened convex and concave margins nearly one line."

The Arisaig specimens exhibit a tendency to "transverse undulations," but, owing to crushing and partial exfoliation of the outer shell, the surface characters are not clear.

Horizon and Locality. Very rare in zones d and e of the Ross Brook formation, rare in zone a of the Moydart, and very rare in zone a of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 6212.

Genus, *Conularia* Miller

1821. *Conularia* Miller, Sowerby's Min. Conchol., 3, p. 107.
1907. *Conularia* Slater, Mon. Brit. Conulariae, Pal. Soc., p. 14.
1913. *Conularia* Dall, Zittel-Eastman Textb. Pal., 2nd ed., p. 572.
1916. *Conularia* Ruedemann, Bull. N.Y. State Mus., 189, p. 86.

Elongate, pyramidal tubes having a square, rectangular, or rhomboid section; aperture much constricted by infolding lobes; a straight groove in a thickened wall at each of the four angles; surface rarely smooth, commonly has transverse and longitudinal ridges. A few septa may be present near the apex. In youth sessile, but in later life may be free. It was the custom to place this genus in the Gastropoda, but Ruedemann has recently pointed out its resemblance to *Serpulites*, and, therefore, it is classified with that annelid genus. Ruedemann compares the thickened walls of *Conularia* with the thickened margins of *Serpulites*, notes the similar composition of the shell in both genera, and shows the possibility of deriving the surface sculpture of *Conularia* from the surface wrinkles of *Serpulites*. Genotype, *Conularia quadrisulcata* Miller.

The three Arisaig species, having coarse transverse ridges and low longitudinal ridges, belong to the section Cancellata.

Conularia twenhofeli n. sp.

Plate I, figures 13, 14, 16; Plate XXVIII, figure 9

Only two incomplete specimens are known. The larger is somewhat flattened, is 25 mm. long, and about 14 mm. wide. The smaller specimen preserves the surface well. The cancellated ornamentation places this species in section III, Cancellata, and in that group it can best be compared with *Conularia planiseptata* Slater[1]; the apical angle is similar, about 18 degrees; the marginal groove is of average depth and rounded below; the facial groove is obscure; the ornamentation is finer, 14 transverse ridges per 5 mm. as compared with 18 per 5 mm.; they form an angle of about 145 degrees. In *C. planiseptata* the ridges continue across the marginal grooves; this is so in our species in the later stages of growth, but apically the groove is smooth. Over most of the surface, the ridges are worn smooth; but obscure and very fine tubercules are present in places. *C. planiseptata* has well-defined tubercles. The longitudinal bars in the transverse grooves are strong and spaced 30 in 5 mm. This is much as in *C. planiseptata.* The apical angle of *C. vesicularis* Slater[1] is smaller, the ornamentation finer, and the longitudinal ridges relatively more widely spaced, forming nearly square interspaces between them. *C. sowerbyi* de Verneuil[2] and *C. breviconventa* Slater[3] have more closely set longitudinal bars, which are in contact laterally.

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[1] Mon. Brit. Conulariae, Pal. Soc., 1907, p. 35, Pl. 5, figs. 1, 2.

Horizon and Locality. Very rare (one specimen) in the Beechhill formation, Beechhill cove, and very rare (one specimen) in zone e of the Ross Brook, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 6008: Peabody Museum of Yale University; paraplastotype, Cat. No. 407.

Conularia honeymani n. sp.

Plate I, figures 9, 10

This is a much larger species than *Conularia twenhofeli* n.sp.; the length of the only and incomplete specimen known is 70 mm. The apical angle is smaller, about 14 degrees. The spacing of the transverse ridges is about the same, 12 per 35 mm. The spacing of the longitudinal ridges is much closer, about 60 per 5 mm. The interspaces between the longitudinal ridges are relatively more narrow and about equal to the width of the ridges. The transverse ridges are studded with fine, but distinct, tubercles. Longitudinal ridges curve across the face; no facial grooves; marginal grooves not preserved.

Compared with *Conularia niagarensis* Hall[4], the ornamentation differs and the apical angle is less. The size, apical angle, and spacing of the transverse ridges are about as in *C. sowerbyi* de Verneuil[5], but the longitudinal ridges and the tubercles of the transverse ridges are not so closely set and the transverse ridges are more curved.

Horizon and Locality. Very rare, one specimen, from zone a of the Moydart formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 3143.

Conularia antigonishensis n.sp.

Plate I, figure 15

Only a part of one individual shell known, length 15 mm., maximum diameter 17 mm. The apical angle is about 15 degrees. Surface is ornamented with transverse ridges meeting at an angle of about 120 degrees, spaced about 10 per 5 mm., and studded with fine tubercles. The longitudinal ridges are low, wide, stout, closely crowded, arranged about 20 per 5 mm., and are separated by very narrow interspaces. The transverse ridges extend across the indistinct facial grooves and are low in the marginal grooves.

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[1] Mon. Brit. Conulariae, Pal. Soc., 1907, p. 36, Pl. 5, figs. 3-6.

[2] Mon. Brit. Conulariae, Pal. Soc., 1907, p. 37, Pl. 5, figs. 7-11.

[3] Mon. Brit. Conulariae, Pal. Soc., 1907, p. 39, Pl. 5, figs. 12-13.

[4] Pal. N.Y., 2, 1852, p. 294, Pl. 65, figs. 1 a-h.

[5] Mon. Brit. Conulariae, Pal. Soc., 1907, p. 37, Pl. 5, figs. 7-11.

Ornamentation resembles that of both *Conularia sowerbyi* de Verneuil and *C. breviconventa* Slater and is nearest to the former. The apical angle is intermediate.

Horizon and Locality. Very rare, one specimen, in zone e of the Ross Brook formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 406.

Genus, *Cornulites* Schlotheim

1820. *Cornulites* Schlotheim, Die Petrefactenkunde, p. 378.
1855. *Cornulites* McCoy, Sedgewick and McCoy, Brit. Pal. Rocks and Foss., p. 63.
1872. *Cornulites* Nicholson, Am. Jour. Sci. (3), 3, pp. 202, 204.
1888. *Cornulites* Hall, Pal. N. Y., 7, supp., p. 8.
1901. *Cornulites* Grabau, Bull. N. Y. State Mus., 45, p. 161.
1913. *Cornulites*, Zittel-Eastman Textb. Pal., 2d ed., p. 139.

Annulated, trumpet-shaped, flexuous tubes; thick cellular walls; ornamented with fine longitudinal striæ. Genotype, *Cornulites serpularius* Schlotheim.

Cornulites serpularius Schlotheim
Plate II, figures 12, 13, 14

1820. *Cornulites serpularius* Schlotheim, Die Petrefactenkunde, p. 378, Pl. 29, fig. 7.
1839. *Cornulites serpularius* Sowerby, Murchison's Silurian System, p. 627, Pl. 26, figs. 5-9.
1855. *Cornulites serpularius* McCoy, Sedgewick and McCoy's Brit. Pal. Rocks and Fossils, p. 63.
1860. *Cornulites flexuosus* var. *gracilis* Hall, Can. Nat. Geol., 5, p. 155.
1868. *Cornulites flexuosus* var. *gracilis* Dawson, Acadian Geology, 2d. ed., p. 606.
1892. *Cornulites flexuosus* Ami, Trans. N.S. Inst. Sci., ser. 2, vol. 1, p. 191.
1892. *Cornulites flexuosus* var. *gracilis* Ami, Trans. N.S. Inst. Sc., ser. 2, vol. 1, p. 191.
1915. *Cornulites clintoni* var. *gracilis* Bassler, Bull. U.S. Nat. Mus., 92, p. 278.

Sowerby's Description. "Its general form is a much elongated, hollow, more or less crooked cone, open at the base; in its early state it is parasitical, being attached by its side and the tubes are often in pairs. The external crust is longitudinally striated, and marked with slightly raised rings, which indicate its passage over the margins of the series of truncated cones of which the fabric is constructed. These short cones . . . form a pyramid of cups, or if viewed in a reversed position, a series of broad rings gradually increasing in size, and capping but not covering each other. . . Internally, each ring was apparently of a cellular structure. . . The cone of the larger specimens is generally rather straight, with the rings regular, and no appearance of having been attached to any other body; but the young specimens are irregularly curved, having more or less distorted rings, and are fixed upon corals or shells. With such only does Schlotheim appear to have been acquainted."

The Arisaig, like the English specimens, indicate some variation in the rate of expansion, depth of rings, curvature, etc. They have the characteristically curved apical portion and the almost straight but flexuous adult portion; they have the longitudinal fine striations, cancellated by more obscure transverse striations, and have been observed in colonies of two to six or even more individuals. *Cornulites clintoni* Hall[1], *C. arcuatus* Conrad[2], and other species from the American Silurian have never been adequately differentiated from this species and it is doubtful if it can be done. Owing to the wide variation of the European shells, species cannot be made on curvature, spacing of annulations, etc., unless they are very pronounced and constant. It is probable that the surface characters of *C. proprius* Hall[3] are sufficiently distinctive to distinguish it as an independent species.

The following measurements indicate the size and form of the tubes and their variation:

——	Length	Expansion	No. annulations
Beechhill	25 mm.	apex to 7 mm.	12
	15 mm.	apex to 2½ mm.	9
Ross Brook	18 mm.	apex to 6 mm.	16
	25 mm.	apex to 9 mm.	14
Moydart	16 mm.	apex to 6 mm.	13
McAdam	35 mm.	7 to 9 mm.	
Stonehouse	20 mm.	6 to 9 mm.	6
	28 mm.	apex to 6 mm.	17
	18 mm.	apex to 6 mm.	13
	28 mm.	apex to 5 mm.	19
	28 mm.	apex to 6 mm.	17
	25 mm.	apex to 4 mm.	22

Horizon and Locality. Rare in the Beechhill formation, Beechhill cove, very rare in zones b to e of the Ross Brook and a to c of the McAdam, common in zone a of the Moydart, common in zones a to c and rare in zone d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 6010, 6009: Peabody Museum of Yale University; plesiotype, Cat. No. 413.

Cornulites subdistans n.sp.

(*sub*, about, near to)

Plate II, figures 15, 16, 17

Compare with:

1852. *Tentaculites distans* Hall, Pal. N.Y., 2, p. 184, Pl. 41A, figs. 9 a, b.

1879. *Cornulites distans* Hall, 28th Rept. N.Y. State Mus. Nat. Hist., mus. ed., p. 185.

1889. *Cornulites distans* Foerste, Proc. Boston Soc. Nat. Hist., 24, p. 274, Pl. 5, fig. 7; Pl. 6, figs. 10, 11.

1915. *Cornulites distans* Bassler, Bull. U.S. Nat. Mus., 92, p. 279.

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[1] Pal. N.Y., 2, 1852, p. 98, Pl. 28, fig. 12 a-e.

[2] Jour. Acad. Nat. Sci., Philadelphia, 8, 1842, p. 276, Pl. 17, fig. 8.

[3] 28th Rept. N.Y. State Mus. Nat. Hist., doc. ed., 1875, 1877, Pl. 31, figs. 1-13.

The surface is only rarely preserved, but most of the specimens exhibit the annular structure of exfoliated shells of this genus. Compared with the coeval *Cornulites serpularius* Schlotheim, this species is more slender and is non-flexuous and perfectly straight like a *Tentaculites.* The annulations are ornamented chiefly with vertical striations, straighter and more distantly spaced than the surface vertical striæ of *C. serpularius;* in addition there are annular growth lines as in *Tentaculites.* Compared with *C. distans* (Hall), the Arisaig species is larger and has more distantly spaced annulations. A diameter of 3·5 mm. is attained and at this stage of growth the annuli are 2 mm. apart. At a diameter of 2 mm. the annuli are 1 mm. distant. The rate of expansion of the tube is about 1 in 10.

A single specimen from the Ross Brook, of similar size, annulations, and straight outline, exhibits in addition irregular, fine, and somewhat rugose transverse striæ. This suggests, as one possibility, that the unweathered surface of this species may have such transverse ornamentation and that the vertical striations represent some internal structure or internal fibre of the shell.

Horizon and Locality. Common in zone d of the Ross Brook formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 415; paratype, Cat. No. 414; a specimen having more distant annuli than in typical species, Peabody Museum of Yale University; Cat. No. 416.

Phylum, **ECHINODERMATA**
Class, *STELLAROIDEA*
Subclass, ASTEROIDEA
Family, PROMOPALAEASTERIDAE Schuchert
Subfamily, Mesopalaeasterinae Schuchert
Genus, *Mesopalaeaster* Schuchert

1914. *Mesopalaeaster* Schuchert, Fossilium Catalogus, Animalia, pt. 3, April, 1914, p. 24.
1915. *Mesopalaeaster* Schuchert, Bull. U.S. Nat. Mus., 88, p. 74.

For generic diagnosis see Schuchert. The one Arisaig species is doubtfully placed in this genus following Schuchert. Its abactinal area is unknown. The actinal plate arrangement is that of the genus, having the three plates in each axillary area. The general actinal appearance, however, as noted by Schuchert, resembles that of *Hudsonaster* and *Palaeaster.* It has the short, stout rays of *Hudsonaster.* Genotype, *Palaeaster shafferi* Hall.

Mesopalaeaster (?) *parviusculus* (Billings)
Plate III, figures 1, 2

1860. *Palaeaster parviusculus* Billings, Can. Nat. Geol., vol. 5, p. 69, text fig.
1868. *Palaeaster parviusculus* Dawson, Acad. Geol., 2nd ed., p. 594, fig. 197.
1913. *Palaeaster parviusculus* Hudson, Bull. N.Y. State Mus., 164, Pls. 1 to 4.

1915. *Mesopalaeaster ? parviusculus* Schuchert, Bull. U.S. Nat. Mus. 88, p. 87, Pl. 9, fig. 1.

Description as Amended by Schuchert. "Measurements: R = 6 mm., r = 2·5 mm., R = 2·4 r. Width of ray at base 3 mm.

"Rays short, stout, tapering rapidly. Disk comparatively large, and without interbrachial arcs.

"Abactinal area unknown.

"Inframarginal plates at the base of the rays very large and thick, highly convex, diminishing rapidly distally, usually quadrangular in form and seven on each side of a ray.

"Just within each axil, inside of the basal inframarginals, there is a single, large, very convex, pentagonal, axillary interbrachial plate.

"Adambulacral plates gradually sinking below the inframarginals proximally, convex and quadrangular in form. There are 13 plates in each column adjoining the very narrow ambulacral furrow, or nearly two plates to each inframarginal ossicle. Two of these plates (oral armature) are situated in front of each axillary interbrachial, uniting the adambulacral columns of adjoining rays.

"Ambulacral plates unknown."

Horizon and Locality. Very rare, one specimen, and probably from the McAdam formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesioplastotype, Cat. No. 3084: U.S. National Museum; plesioplastotype, Cat. No. 60620.

Family, URASTERELLIDAE Schuchert

Genus, *Urasterella* McCoy emend Schuchert

1851. *Urasterella* McCoy, Brit. Pal. Foss., p. 59.
1915. *Urasterella* Schuchert, Bull. U.S. Nat. Mus., 88, p. 173.
Genotype, *Uraster ruthveni* Forbes.

Urasterella ruthveni var. *arisaigensis* Ruedemann

1916. *Urasterella ruthveni* mut. *arisaigensis* Ruedemann, Bull. N.Y. State Mus., 189, p. 46, Pl. 11, figs. 5, 6; Pl. 12, fig. 3.

Only two specimens are known and they are in the New York State Museum. Both the abactinal and actinal sides are preserved and described by Ruedemann. As, however, only the actinal side of *Urasterella ruthveni* (Forbes) is known, no positive identification with it can be made. The English species occurs in the Upper Ludlow of Westmoreland, England. Assuming the Arisaig beds, from which the two specimens came, to be of a slightly earlier age, Ruedemann described the Arisaig specimens as a mutation of the English species. The beds, however, are of the same age and if the Arisaig specimens differ slightly from the English forms they constitute a variety, not a mutation.

Horizon and Locality. Very rare in zone c of the Stonehouse formation, mouth of Stonehouse brook, Arisaig, N.S.

Types. New York State Museum; holotype and paratype.

Phylum, **MOLLUSCOIDEA**
Class, *BRACHIOPODA* Dumeril
Order, **Atremata** Beecher
Superfamily, Lingulacea Waagen
Family, LINGULIDAE Gray
Genus, *Lingula* Bruguière

1792. *Lingula* Bruguière, Encyclopédie Méthodique, 1, Pl. 250.
1892. *Lingula* Hall and Clarke, Pal. N.Y., 8, pt. 1, pp. 2, 161.
1913. *Lingula* Schuchert, Zittel-Eastman Textb. Pal., 2d ed., p. 374.

Acuminate to subquadrate, equivalve Lingulaceae; broad in the pallial region; highly differentiated lingulid muscles, but indistinct muscular scars; shell substance of alternating layers of chitinous and calcareous material. Genotype, *Lingula anatina* Lamarck.

Lingula clintoni Vanuxem
Plate II, figure 2

1839. *Lingula oblonga* Conrad (non Eichwald), 3d Ann. Rept. Geol. Surv., N.Y., p. 65.
1842. *Lingula clintoni* Vanuxem, Geol. N.Y., Rept. 3d Dist., p. 79, fig. 4.
1843. *Lingula oblonga* Hall, Ibid., Rept. 4th Dist., p. 77, fig. 4.
1852. *Lingula oblonga* Hall, Pal. N.Y., 2, p. 54, Pl. 20, fig. 1.
1892. *Lingula oblonga* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 187.
1897. *Lingula clintoni* Schuchert, Bull. U.S. Geol. Surv., 87, p. 245.
1915. *Lingula clintoni* Bassler, Bull. U.S. Nat. Mus., 92, p. 726.

Hall's Description of 1852. "Shell oblong, the sides nearly straight and parallel; abruptly rounded or sub-acute above; truncate, with scarcely rounded angles at the base; flat below, and very convex toward the beak, the shell extending thence in a ridge; surface marked by concentric lines of growth and fine longitudinal or sub-radiating striæ.

"...... The general proportions of the shell are somewhat variable, owing, partly, to pressure; but it is readily distinguished by its straight nearly parallel sides, and nearly equal width throughout."

Although the Arisaig specimens vary much in size and to some extent in elongation, they all have the oblong, almost straight-sided outline, and a somewhat truncated base and subacute beak.

Width 7 mm., length 14 mm.
Width 10 mm., length 16 mm.
Width 14 mm., length 23 + mm.

Horizon and Locality. Rare in the Beechhill formation at Beechhill cove, very rare in zones b, c, and e of the Ross Brook, and very rare in zone b of the McAdam formation, coast section, Arisaig, N.S. This species also occurs in the Clinton and Cataract formations of New York and Ontario.

Type. Peabody Museum of Yale University; plesiotype, Cat. No. 409.

Lingula subacutirostris n.sp.

(*sub*, about, near to; *acutirostris*, a species name)
Plate II, figures 1, 3

Like Hall's species *Lingula acutirostris*[1], this shell is wide and broadly rounded anteriorly, converges rather abruptly posteriorly, and is covered with somewhat coarse concentric striæ. It is, however, proportionately longer and the apex is not quite so acute as in Hall's figure of *L. acutirostris.* Because of these differences, and as so little is known of Hall's species, the Arisaig specimens are placed in a separate, although closely related species. The lateral margins are more rounded and the outline less elongate than in *L. cuneata* Conrad[2] and *L. crumena* Phillips[3]. In all its variations *L. symondsi* Salter[4] is not so convergent in outline, and the maximum width is nearer the centre of the shell.

Width 6–11 mm., length 9–19 mm.

Horizon and Locality. Rare in zone d and very rare in zone e of the Ross Brook formation, coast section, Arisaig, N.S. *Lingula acutirostris* Hall was found in the Clinton shale at the Walcott ore-bed, Walcott, N.Y.

Types. Peabody Museum of Yale University; holotype, Cat. No. 408: Victoria Memorial Museum; paratype, Cat. No. 6197.

Lingula minima Sowerby

Plate II, figure 4

1839. *Lingula minima* Sowerby, Murchison's Sil. Syst., p. 612, Pl. 5, fig. 23.
1871. *Lingula minima* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 48, Pl. 2, figs. 36-44.

Compare:

1913. *Lingula minima* var. *americana* H. S. Williams, Proc. U.S. Nat. Mus., 45, p. 340, Pl. 31, fig. 6.

Davidson's Description. "Shell small, oblong, elongated; sides curved, gradually merging into the slopes forming the acuminate pointed beaks; front rounded; valves slightly convex and marked with fine concentric striæ."

Compared with *Lingula clintoni* Vanuxem, the outline is more elongate, both the lateral and anterior margins are more rounded, the apex is more acute, and the convexity is less. As only two specimens are known, the Arisaig range of variation cannot be determined. Like *L. minima* var. *americana* H. S. Williams, the Arisaig specimens are more slender than the average of Davidson's figures. Compared with the Maine variety, they are a little more convergent posteriorly.

Width 7 mm., length 14 mm.

Horizon and Locality. Very rare in zone c of the Stonehouse formation, coast section, Arisaig, N.S. According to Elles and Slater it is found in the Downton Castle sandstones, Temeside group, Ludlow district,

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[1] Geol. New York, Rept. 4th Dist. 1843, p. 77, text fig. 9.
[2] Geol. New York, Rept. 4th Dist. 1843, p. 48, text fig. 5.
[3] Mon. Brit. Sil. Brach., Pal. Soc., p. 40, Pl. 2, figs. 1-6.
[4] Mon. Brit. Sil. Brach., Pal. Soc., p. 45, Pl. 3, figs. 7-17.

England. Davidson[1] records it from the Downton sandstone, on Old Leominster road, near Ludlow, at Downton Castle and near Lesmahago, Lanarkshire. *L. minima* var. *americana* occurs in the Hersey member of the Silurian Pembroke formation, at Pembroke, Maine.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 6198.

Lingula lewisi Sowerby
Plate II, figures 5, 6

1839. *Lingula lewisi* Sowerby, Murchison's Sil. Syst., Pl. 6, fig. 9.
1871. *Lingula lewisi* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 35, Pl. 3, figs. 1-6.

Davidson's Description. "Subquadrate, oblong, longer than wide; sides almost parallel; front very slightly rounded; beaks obtusely angular, the slopes rarely straight; valves almost equally deep, the convexity very small; surface nearly smooth, or marked with numerous concentric raised lines or ridges of growth, and here and there by more deeply indented striæ."

Compared with *Lingula clintoni* Vanuxem, the outline is proportionately somewhat broader and the valves are a little less convex. They are, however, very similar. The surface, where preserved, is covered with very fine growth lines. The inner layers of one of the Arisaig specimens exhibit what appear to be fillings of coarse punctæ; it may be distinct from the other specimens and a *Lingulipora* Girty.

Width 9 mm., length 14 mm.

Horizon and Locality. Very rare in zone a of the Moydart and rare in zone c of the Stonehouse formation, coast section, Arisaig, N.S. Common in the Wenlock of England.

Types. Victoria Memorial Museum; plesiotype, Cat. No. 6199: Peabody Museum of Yale University; plesiotype, Cat. No. 410.

Lingula taeniola Hall and Clarke
Plate II, figure 7; Plate XXVIII, figure 6

1852. *Lingula lamellata* Hall (partim), Pal. N.Y., 2, p. 55, Pl. 20, fig. 4.
1892. *Lingula taeniola* Hall and Clarke, Ibid., 8, pt. 1, pp. 18, 173, Pl. 4 k, fig. 8.
1892. *Lingula lamellata*? Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 187.
1897. *Lingula taeniola* Hall and Clarke, 48th Rept. N.Y. State Mus., 2, 1895 (=1897), p. 327, Pl. 1, fig. 4.
1897. *Lingula taeniola* Schuchert, Bull. U.S. Geol. Surv., 87, p. 254.
1915. *Lingula taeniola* Bassler, Bull. U.S. Nat. Mus., 92, p. 734.

Hall and Clarke's Description of 1897. "Shell of medium size, with the margins diverging rapidly from the apex for a short distance, thence curving rather abruptly into subparallel lateral margins. The anterior margin is nearly transverse. Surface covered with fine, elevated, nearly horizontal ornamental lines, which are crossed in the umbonal region by the concentric growth lines."

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[1] Mon. Brit. Sil. Brach., Pal. Soc., p. 49.

"The prominent features .... are the transverse lamellose lines, which, instead of curving round and tending upwards toward the beak, terminate in the margin, the finer concentric lines of growth being visible only for a little space on each side below the beak. These strong lamellæ are equally visible on the inner side of the shell."

Lingula taeniola Hall and Clarke known heretofore only in the Clinton of New York, has a long range at Arisaig. The lamellæ are rather fine, but distinct and equidistant. It attains its largest size in the Stonehouse formation.

Ross Brook specimens, width 6 mm., length 10 mm.
Moydart specimens, width 8 mm., length 12 mm.
Stonehouse specimens, width 12 mm., length 21 mm.

Horizon and Locality. Very rare in zones b and e of the Ross Brook, very rare in zone b of the McAdam, very rare in zone a of the Moydart, and very rare in zone c of the Stonehouse formation, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotype, Cat. No. 6200: Peabody Museum of Yale University; plesiotype, Cat. No. 475.

Subgenus, *Palaeoglossa* Cockerell

1848. *Glossina* Phillips (non Wiedemann), Mem. Geol. Surv., Great Britain, 2, pt. 2, p. 370.
1892. *Glossina* Hall and Clarke, Pal. N.Y., 8, pt. 1, pp. 15, 164 (gen. ref.).
1911. *Palaeoglossa* Cockerell, Nautilus, 25, No. 8, p. 96.

Trigonal Lingulæ in which the lateral margins rapidly converge to a subacute apex. Genotype, *Lingula attenuata* Sowerby.

Lingula (*Palæoglossa*) *distornata* n.sp.

(*distans*, distant; *ornatus*, adorned)
Plate II, figure 8

The surface is covered with fine raised, concentric, striæ, having flat interspaces, and nearly 1 mm. apart; laterally they become more closely spaced. The lateral margins converge toward the beak. The anterior part of the shell is not preserved. Compared with *L. striata* Sowerby[1] the striæ are coarser and far more distantly spaced. The Arisaig specimens approach very closely to some variations of the Lower Helderberg species *L. perlata* Hall, but the latter has an ovate outline and a subacute apex. The concentric striæ are more widely spaced than in *Lingula* (*Palæoglossa*) *perovata* Hall.[2]

Width 12 mm., length 10 + mm.

Horizon and Locality. Very rare, one specimen, in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 6201.

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[1] Mon. Brit. Sil. Brach., Pal. Soc., p.45, Pl. 3, figs. 45-48.
[2] Pal. N.Y., 2, 1852, p. 55, Pl. 20, fig. 3.

Order, **Neotremata** Beecher
Superfamily, Discinacea Waagen
Family, TREMATIDAE Schuchert
Genus, *Schizocrania* Hall and Whitfield

1875. *Schizocrania* Hall and Whitfield, Pal. Ohio, 2, p. 71.

The shells here referred to the Ordovician genus *Schizocrania* Hall and Whitfield,[1] differ somewhat from the normal genus. When more is known of them, they should be incorporated in a new genus. Exterior of dorsal valve as in *Schizocrania:* evenly convex; beak small, submarginal; surface covered with fine radiating striæ. Interior of dorsal valve unknown. Ventral valve flat as in *Schizocrania:* but beak nearer posterior margin; surface covered with radiating striæ, more widely spaced than on the dorsal valve; in *Schizocrania* radiating striæ are lacking and concentric striæ are prominent. Pedicle notch not deep as in *Schizocrania* but much more shallow. Margins of notch somewhat infolded, more so than in *Schizocrania,* but not forming a depressed pedicle area as in *Trematis* Sharpe.[2] No listrium is observed, but may be present.

The above diagnosis is based on a new species from Arisaig. Several Devonian species are thought to be congeneric. *Schizocrania* (?) *helderbergensis* Hall and Clarke[3] from the Lower Helderberg near Clarkesville, N.Y., has a similar dorsal and ventral valve: the dorsal valve has a subterminal beak and fine radiating striæ; the ventral valve has a similarly situated apex, similar radiating striæ, and small triangular notch; no listrium has been observed. Two other Devonian species may be congeneric, *Schizocrania superincerta* Barret[4] from the Lower Oriskany of New Jersey and *Schizocrania* sp. Schuchert[5] from the New Scotland member of the Helderberg formation of Maryland; only the dorsal valve of each is known and they have the external characteristics of *Schizocrania.*

The shells here referred to *Schizocrania* may have been derived from the normal Ordovician genus *Schizocrania.* The known modifications required to produce the shells here referred to *Schizocrania* out of true *Schizocrania* are, the adding of radiating sculpture to the surface of the ventral valve, the shallowing of the pedicle notch, and the infolding of the margins of the pedicle notch. Until more is known, however, of the pedicle notch of these shells, particularly as to the presence or absence of a listrium, the question of their origin should be left open, and the erection of a new genus for them should be postponed. Genotype, *Orbicula*? *filosa* Hall.

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[1] Pal. Ohio, 2, p. 71.
Pal. N.Y., 8, pt. 1, p. 142.
Zittel-Eastman Textb. Pal., 2d. ed., p. 377.

[2] Quart. Jour. Geol. Soc., vol. 4, 1848, p. 66.

[3] Pal. N.Y., vol. 8, pt. 1, p. 179, Pl. 4 G, figs. 34, 35.

[4] Geol. Surv., N.J., Pal., vol. 3, 1903, p. 323, Pl. 41, fig. 4.

[5] Maryland Geol. Surv., Low. Dev., 1913, p. 292.

Schizocrania megumaensis n.sp.
(*Megumage*, Indian name of Nova Scotia)
Plate II, figures 9, 10, 11

This species closely resembles *Schizocrania helderbergensis* (Hall and Clarke), but has finer and more numerous radiating striæ on the pedicle valve. The finer intermediate striæ of Hall and Clarke's species are not present. As in that species, there are no radiating striæ on either side of the pedicle notch. The latter extends to the posterior margin as a broad triangular slit. Some specimens attain a moderately large size for the genus. The outline is almost circular.

Width 14 mm., length 15 mm.
Width 8 mm., length 8 mm.

Horizon and Locality. Rare in zone d and very rare in zone e of the Ross Brook formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; paraplastotype, Cat. No. 6202: Peabody Museum of Yale University; holotype, Cat. No. 411; paratype, Cat. No. 412.

Family, DISCINIDAE Gray
Genus, *Orbiculoidea* D'Orbigny

1847. *Orbiculoidea* D'Orbigny, Compt. Rend. de l'Acad. Sci., 25, p. 269.
1892. *Orbiculoidea* Hall and Clarke, Pal. N.Y., 8, pt. 1, p. 125, fig. 64.
1913. *Orbiculoidea* Schuchert, Zittel-Eastman Textb. Pal., 2d ed., p. 377.

Suborbicular to elliptical, inequivalve discinids; the dorsal valve is in most species more convex than the ventral; the pedicle furrow begins a little posterior to the apex of the ventral valve and, descending into the substance of the shell, communicates with the interior, through a tubular process which opens near the posterior margin. Genotype, *Orbicula morrisi* Davidson.

According to Hall and Clarke, *Schizotreta* Kutorga has essentially the structural characters of *Orbiculoidea* D'Orbigny, but the relative convexity of the valves is reversed and the shells are thicker. *Orbiculoidea subplana* (Hall), one of the species treated below, approaches this genus; for the two valves are almost equally convex.

Orbiculoidea subplana (Hall)
Plate II, figures 18, 19, 20

1860. *Discina tenuilamellata* var. *subplana* Hall, Can. Nat. Geol., 5, p. 144.
1878. *Discina tenuilamellata* var. *subplana* Dawson, Acadian Geol., 3d ed., p. 595.
1892. *Discina tenuilamellata* var. *subplana* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 187.
1894. ?*Discina fletcheri* Ami, Ibid., ser. 2, 1, p. 412.
1897. *Orbiculoidea subplana* Schuchert, Bull. U.S. Geol. Surv., 87, p. 281.
1915. *Orbiculoidea subplana* Bassler, Bull. U.S. Nat. Mus., 92, p. 883.

Original Description. "Shell broadly elliptical, or suborbicular, externally depressed, apex subcentral; surface marked by thin sharply elevated lamellæ.

"This closely resembles the Niagara species of New York, but may be distinct."

The outline varies from almost circular to slightly elongate elliptical. *Orbiculoidea* (*Schizotreta*) *tenuilamellata* (Hall)[1] is, according to Hall's description and figure and Hall and Clarke's figures, circular. Compared with the latter the apex of the dorsal valve of the Arisaig species is not central, but on the average is situated about one-fifth to one-seventh the distance from the posterior margin. The surface of the dorsal valve is moderately and evenly convex. The pedicle valve of most specimens is crushed, but when well preserved is moderately convex, of about the same degree as the dorsal; the apex is a little more anterior than in the dorsal valve, and about one-third from the posterior margin; compared with this, the apex of the pedicle valve of *O.* (*Schizotreta*) *tenuilamellata* (Hall) is more central.

One or two specimens are more orbicular, and have the dorsal apex more central; these approach more nearly to *O.* (*Schizotreta*) *tenuilamellata.*

Width 10 mm., length 11 mm.
Width 7 mm., length 7·5 mm.
Width 15 mm., length 17 mm.

Horizon and Locality. Common in zone d and rare in zone e of the Ross Brook, rare in zone b and very rare in zone c of the McAdam, rare in zone a of the Moydart, very rare in zone a, rare in zone b, common in zone c, and rare in zone d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; plesioplastotype, Cat. No. 6203: Peabody Museum of Yale University; plesiotype, Cat. No. 417.

Orbiculoidea novascotica (Ami)

Plate II, figures 21, 22

1894. *Discina novascotica* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 412.
1915. *Discina ?? novascotica* Bassler, Bull. U.S. Nat. Mus., 92, p. 457.

Original Description. "Shell broadly elliptical or sub-circular in outline. Dorsal or free valve very convex. Slope of the shell from the apex to the anterior extremity of this valve, regularly and evenly convex, whilst the slope on the posterior side of the apex, eccentric, incurved, pointing posteriorly, and situated at about one-sixth the length from the posterior margin.

"Surface of the dorsal valve, black and shining—marked by numerous concentric lines or rounded wrinkles of growth which are crossed by more delicate and very numerous threadlike lines, radiating from the apex to the outer margin. These radiating lines are obsolete or well-nigh so on the apex. Lower or attached valve, unknown.

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[1] Pal. New York, 2, 1852, p. 250, Pl. 53, fig. 3.

"Dimensions of the dorsal valve of one specimen as follows: length: 10 millimetres; breadth: 7½ millimetres; height of apex above lower valve: 3½ millimetres."

Ami's species can be distinguished from *Orbiculoidea subplana* (Hall) by its more elongate elliptical outline, its much greater convexity, the much steeper slope posterior to the apex, the more posterior position of the apex, and the different surface ornamentation. It is covered by coarse, concentric, irregular wrinkles of growth, and fine growth lines. Compared with *O. forbesi* (Davidson), the apex is situated nearer the posterior margin, the slope posterior to the apex is steeper, the outline is more elongate, and the concentric ridges of growth are coarser, more irregular, and more closely arranged.

Horizon and Locality. Very rare in zone a of the Moydart, and rare in zone a, very rare in zone b, and rare in zone c of the Stonehouse formation, coast section, Arisaig, N.S. Originally described by Ami from cape George, Antigonish county, N.S.

Type. Victoria Memorial Museum; lectotype, Cat. No. 6204.

Superfamily, Craniacea Waagen
Family, CRANIIDAE King
Genus, *Pholidops* Hall

1859. *Pholidops* Hall, Pal. N.Y., 3, p. 489.
1892. *Pholidops* Hall and Clarke, Ibid., 8, pt. 1, p. 155, Pl. 4 (I), figs. 17-37.
1913. *Pholidops* Schuchert, Zittel-Eastman Textb. Pal., 2d ed., p. 379.

Small, biconvex, patelliform, equivalve to somewhat inequivalve, inarticulate craniids, which may be slightly attached. The concentric lamellose lines of growth are in some species crossed by faint radiating lines. Marginal surfaces of contact, broad and smooth. Apex subcentral to terminal. The well-defined muscle area is concentrated in the apical part of each valve. Genotype, *Orbicula squamiformis* Hall.

Pholidops acadiensis (Hall)

Plate II, figure 23; Plate X, figure 10

1860. *Crania acadiensis* Hall, Can. Nat. Geol., 5, p. 144, fig. 1.
1868. *Crania acadiensis* Dawson, Acadian Geol., 2d ed., p. 595, fig. 198.
1892. *Pholidops implicata* Ami (non Sowerby), Trans. N.S. Inst. Sci., ser. 2, 1, p. 187.
1897. *Crania acadiensis* Schuchert, Bull. U.S. Geol. Surv., 87, p. 188.
1915. *Crania acadiensis* Bassler, Bull. U.S. Nat. Mus., 92, p. 285.

Original Description. "Circular or broadly suboval, moderately convex, the greatest convexity near the apex; apex obtuse.

"Several casts show a central elevated area, with strong muscular impressions; the more elevated portion being surrounded by a flattened border, which is radially striate.

"These specimens are casts which appear to be of the ventral valve; and the form of the muscular impressions is so characteristic of the genus that I can have little hesitation in thus referring them."

The outline is elongate oval, not circular. In one or two specimens the anterior margin is somewhat acutely rounded. None of the specimens collected have the two valves together, but as some of the valves are much more convex than others, the species is probably somewhat inequivalve, thus resembling *Pholidops implicata* (Sowerby)[1] and differing from *P. squamiformis* (Hall)[2]. *P. implicata* and *P. ovalis* Hall [3] are both broader anteriorly and more elliptical in outline.

Average width 3 mm., average length 4 mm.

Horizon and Locality. Very rare in zone d of the Ross Brook, very rare in zone b of the McAdam, very rare in zone a of the Moydart, very rare in zones a and b of the Stonehouse, and very common in zone c of the Stonehouse, coast section; common in zone d of the Stonehouse formation, Stonehouse Brook section, Arisaig, N.S.

Types. Peabody Museum of Yale University; plesiotypes, Cat. Nos. 418, 445d.

Order, **Protremata** Beecher
Superfamily, Orthacea Walcott and Schuchert
Family, ORTHIDAE Woodward
Subfamily **Dalmanellinae** Schuchert
Genus, *Dalmanella* Hall and Clarke

1892. *Dalmanella* Hall and Clarke, Pal. N.Y., 8, pt. 1, pp. 205, 223.
1913. *Dalmanella* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 382.

Striate, planoconvex or even biconvex orthids, which have rather well-defined cardinal areas that are shorter than the greatest width of the shell. Shell structure punctate. A ventral fold and dorsal sinus is present in most species. Ventral muscle area short and narrow. Genotype, *Orthis testudinaria* Dalman.

All Silurian Dalmanellas show some advance, in one or more characters, over their Ordovician progenitors. The lines of progress in a number of characters are revealed in the ontogeny of advanced Silurian species like *D. elegantula* Dalman and *D. wisbyensis* Lindstrom: the outline proceeds from transverse to slightly elongate and from subrectangular to subelliptical; the ventral valve increases in gibbosity; the umbo from a very low position rises high above the cardinal margin and the beak curves over and partly covers the cardinal area; the hinge-line shortens somewhat, but not as in *Rhipidomella;* the striation proceeds from comparatively coarse, angular to much finer, low and rounded striæ. Ordovician forms like *D. testudinaria* (Dalman) stand at one end of the series and an advanced Silurian species like *D. wisbyensis* Lindstrom at the other. The new characters are taken on in varying degree by individual species and, indeed, Silurian Dalmanellas may be classified in accordance with the degree of assumption of them. Thus there is the *conservative* group, including *D. canaliculata* Lindstrom, *D. modesta* Savage, and *D. conservatrix* n.sp.; these have a primitive transverse, subrectangular outline, low ventral valve, low umbo, and comparatively coarse, and in some specimens angular, surface striation. Other species have similar primitive characters, but are not so transverse; they form the *less conservative* group: among them are *D. edgewoodensis* Weller, *D. eugeniensis* M. Y. Williams, and *D. eugeniensis* var. *palaeoelegantula* M. Y. Williams. Next are the *intermediate* species like *D. basalis* Dalman and *D. elegantula* var. *primitiva* n. var.: these have the gibbous ventral valve of the higher forms, but the striæ are not so fine, the hinge-line is longer, and the umbo lower. Finally, there is the *maximum* group which includes *D. wisbyensis* Lindstrom, *D. elegantula* Dalman, *D. elegantula* (American form), *D. elegantula* var. *media* (Shaler), and *D. elegantula* var. *submedia* n. var.; the first three are in descending order as advanced forms; the American form of *D. elegantula* has in general a somewhat lower umbo than the North European specimens and the varieties listed are nearest to the American variety. Unfortunately, the evolution that produced these forms took place very early in Silurian time and the unmodified types continue, so that little stratigraphic use can be made of it. As far as the writer can determine from specimens accessible and from the literature, however, no *maximum* forms appeared before Clinton or Upper Llandovery time. The pre-Clinton Silurian forms are either *conservative, less conservative*, or *intermediate* forms, and chiefly the first two.

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[1] Mon. Brit. Sil. Brach., Pal. Soc., p. 80, Pl. 8, figs. 13-18.
[2] Pal. New York, 2, 1852, p. 250, Pl. 53, figs. 4 a, b.
[3] Pal. New York, 8, pt. 1, 1892, p. 157, Pl. 41, fig. 20.

As Silurian time went on there was a tendency to revert to the transverse outline. Thus at Arisaig *D. elegantula* var. *submedia* n. var., gave off in zone c of the McAdam a transverse form, *D. elegantula* var. *transversaria* n. var.

Though it would be hardly possible to point out the actual progenitor or progenitors of Devonian *Dalmanella*, it can be said that, among the forms mentioned above, the American variety of *D. elegantula* stands the nearest. *D. orbicularis* (Sowerby) has many of the marks of a species approaching those of the Devonian.

Dalmanella conservatrix n.sp.

(*conservatrix*, preserver)

Plate II, figures 24, 25, 26

An unprogressive generalized *Dalmanella*, having an Ordovician rather than a Silurian aspect and similar in form to *D. testudinaria* (Dalman). It is more gently convex than the average of that species and the hinge-line is shorter, about two-thirds the width of the shell. The dorsal valve is flatter and has no median sinus. The striæ are angular like those of *D. testudinaria*, but much finer and alternating in size; striæ, 32 per 10 mm. *D. elegantula* (Dalman) has still finer and more rounded striæ. The size is about one-third that of *D. testudinaria;* length 8 mm., width 10 mm.

D. canaliculata (Lindstrom)[1] and *D. modesta* Savage[2] are likewise generalized Dalmanellas having a transverse outline, umbo little raised above the hinge-line, and striation subangular, and intermediate in fineness between *D. testudinaria* and *D. elegantula*. *D. canaliculata* has a more convex ventral valve, umbo proportionately more prominent, the dorsal valve has a median sinus, and the striæ do not alternate in size. *D. modesta* is more convex and the striation differs in detail. *D. intercostata* (Portlock)[1] from the Caradoc has alternating striæ, but they are threadlike and have wide interspaces.

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[1] Mon. Brit. Sil. Brach., Pal. Soc., p. 218, Pl. 27, figs. 12, 13.

[2] Savage, T. E., Bull. Geol. Surv., Ill., 23, 1913, p. 48, Pl. 1, figs. 14, 15.

Horizon and Locality. Very rare in zone b of the Ross Brook formation. The Stonehouse formation has furnished a single small specimen of a ventral valve of similar shape that may belong to this species.

Types. Victoria Memorial Museum; holoplastotype, Cat. No. 6205; paraplastotypes, Cat. Nos. 6206, 6207.

Dalmanella elegantula mut. *primitiva* n. mut.

(*primitivus*, first)

Plate III, figure 7

This mutant differs from the North European *D. elegantula* (Dalman) in the lower umbo which scarcely rises above the hinge-line, and from the interior American form in its greater width near the hinge-line. It differs from both forms in the somewhat longer hinge-line and the cardinal area is apparently more exposed. These characters give the shell a slightly more truncated posterior outline than in *D. elegantula*. *D. basalis* (Dalman)[2] shows similar primitive characters, but is more remotely removed; for the hinge-line is even longer and equal to the greatest width of the shell; the striation is coarser and not rounded, the ventral valve is less gibbous, and the cardinal area is not covered by the incurving of the beak. The Arisaig mutation occupies a position intermediate between *D. basalis* and *D. elegantula*, and is nearest to *D. elegantula*.

Horizon and Locality. Common in parts of the Beechhill formation, Beechhill cove, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 421.

Dalmanella elegantula var. *submedia* n. var.

(*sub*, near to; *media*, a species name)

Plate III, figures 3 to 6; Plate IV, figure 8

Although this variety, throughout its long range at Arisaig, varies slightly in fineness of striation and also to some extent in size, it maintains its form with little variation or mutation. In general outline, it resembles the interior American *D. elegantula* (Dalman) and especially the more orbicular Anticosti variety, *D. elegantula* var. *media* (Shaler).[3] Like the latter, the Arisaig variety is proportionately much shorter than *D. elegantula*, but is still slightly elongate. It differs from the Anticosti variety and the normal species in the deeply impressed dorsal sinus. Some specimens are fairly carinate. *D. postelegantula* Weller[4] also has a deep dorsal sinus and is related in general form to the interior American *D. elegantula*, but it has a transverse outline and a more convex dorsal valve. According to Weller, this species is intermediate between *D. elegantula* and *D. subcarinata* (Hall)[1]. It may be added that this evolution has more probably proceeded from the interior American form of *D. elegantula* or some of its western Atlantic varieties than from the North European form, with its umbo more highly produced above the hinge-line.

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[1] Mon. Brit. Sil. Brach., Pal. Soc., p. 217, Pl. 27, figs. 10, 11.

[2] Mon. Brit. Sil. Brach., Pal. Soc., p. 236, Pl. 38, figs. 1-3.

[3] Bull. Mus. Comp. Zool., 1, 1865, p. 65.

[4] Geol. Surv., New Jersey, Pal., 3, 1903, p. 232, Pl. 20, figs. 21-24.

The size is only about one-quarter that of *D. elegantula media* and about equal to that of *D. postelegantula;* average length 11 mm., average width 10 mm.; there are a few larger specimens in the Stonehouse formation which have a maximum length of 15 mm. and width of 14 mm. Although there is no gradual increase in size, and the highest occurring specimens are of average size, the largest are found in the upper part of the Stonehouse formation.

There is some variation in the fineness of striation. In the lower part of the McAdam formation, the striæ are uniformly fine, about 30-35 per 10 mm. on the anterior margin; in the upper part, the striæ are a little coarser and average 28 per 10 mm.; in the Moydart and Stonehouse formations the striation is fine on the average as in the lower part of the McAdam, but varies also a little toward coarser striation.

Horizon and Locality. Very common in zones b and c of the McAdam formation, common in zone a of the Moydart, and common in zones a to c of the Stonehouse, coast section; rare in zone d of the Stonehouse, Stonehouse brook, Arisaig, N.S. *D. elegantula media* is found in the Jupiter and Chicotte formations, Anticosti. *D. postelegantula* is found near the top of the Silurian (Decker ferry), New Jersey.

Types. Victoria Memorial Museum; holotype, Cat. No. 6208; holoplastotype, No. 6208a: Peabody Museum of Yale University; paratypes, Cat. Nos. 419, 420, 428.

Dalmanella elegantula mut. *transversaria* n. mut.
(*transversarius*, transverse)
Plate III, figures 8, 9

This is merely a broad, long-hinged mutation of *Dalmanella elegantula* var. *submedia* n. var.; striation like that of *D. elegantula submedia* as found in the upper part of the McAdam; other characters as in that variety. Width 10 mm., length 7 mm. Like the coeval slight coarsening of the striation of *D. elegantula submedia* in the upper part of the McAdam, the mutation to a transverse form is a reversion to ancestral characters.

This mutant can be distinguished from *D. lunata* (Sowerby)[2] by the greater convexity of the ventral valve, the deep sinus of the dorsal valve, and the smaller size.

Horizon and Locality. Common in zone c of the McAdam formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 423; paratype, Cat. No. 422.

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[1] Pal. N.Y., 3, 1859, p. 169, Pl. 12, figs. 7, 8, 13-21.

[2] Murchison's Silurian System, 1839, p. 611, Pl. 5, fig. 15.

Dalmanella wisbyensis var. *nana* n. var.

(*nanus*, dwarf)

Plate III, figures 10 to 17

A variable species nearest to *Dalmanella wisbyensis* (Lindstrom)[1]. In form it grades away from the latter to a shell having a slightly transverse outline, and a longer hinge-line. The high umbonal region, the fine striation, and the shape of the dorsal valve are characters of *D. wisbyensis*. A few specimens having a deeper dorsal sinus are somewhat carinate. The size is about one-third that of *D. wisbyensis* and about equal to that of a *D. wisbyensis*-like shell in the Anticosti Silurian. The Arisaig variety differs from Lindstrom's species and the Anticosti shell in the more prominent median septum of the dorsal valve, which is proportionately more highly elevated and anteriorly broadens and thickens into an elongate node.

D. elegantula var. *parva* (Foerste)[2] is a small shell in the Ohio Brassfield formation, being followed by the species in mature size in higher beds. This, however, is not described as a *wisbyensis*-like form. There is no *D. wisbyensis* in the New York Clinton or Cataract formation.

D. wisbyensis is found in the Silurian of the island of Gotland, in beds b and c of Lindström and divisions I, II, and III of Hedström.

Length 8–9 mm.; width 9 mm.

Horizon and Locality. Very common, zones b to e of the Ross Brook formation, and very rare in zone b of the McAdam formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 424; paraplastotypes, Cat. Nos. 424a, 424b; paratype, Cat. No. 424c.

Dalmanella lunata (Sowerby)

Plate IV, figures 5, 6

1839. *Orthis lunata* Sowerby, Murchison's Sil. Syst., p. 611, Pl. 5, fig. 15.
1855. *Orthis lunata* McCoy (part), Brit. Pal. Foss., p. 220.
1869. *Orthis lunata* Davidson (part), Mon. Brit. Sil. Brach., Pal. Soc., p. 215, Pl. 28, figs. 1-5.
1913. *Dalmanella lunata* H. S. Williams (part), Proc. U.S. Nat. Mus., 45, p. 337, Pl. 30, figs. 3, 8.

In 1839 Sowerby described the species *Orthis lunata* and *O. orbicularis* from the Upper Ludlow. Later, McCoy and Davidson grouped both forms under *O. lunata*. At Arisaig the corresponding forms are readily distinguished and the circular type is here separated as a distinct species following Sowerby. The *lunata* type is transverse in outline, has a moderately convex ventral valve, a slightly convex dorsal valve, and a slight dorsal median depression. It is readily distinguished from *Dalmanella elegantula* by its greater depressed character, lesser inequality of the two valves, and the transverse outline. Length 15 mm., width 22 mm.

This is an Upper Ludlow species and has been found by Henry Shaler Williams in the Pembroke formation at Leighton cove, Maine.

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[1] Ofvers. K. Svenska Vetensk,-Akad., Förhand, 1860, 17.

[2] Bull. Sci. Lab. Denison Univ., 1, 1885, p. 85, Pl. 13, fig. 17.

Horizon and Locality. Very rare in zones a to c of the Stonehouse, coast section; rare in zone d of the Stonehouse formation, Stonehouse brook, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotype, Cat. No. 5408: Peabody Museum of Yale University; plesiotype, Cat. No. 427.

Dalmanella orbicularis (Sowerby)

Plate IV, figure 7

1839. *Orthis orbicularis* Sowerby, Murchison's Sil. Syst., p. 611, Pl. 5, fig. 16.
1852. *Orthis lunata* McCoy (part), Brit. Pal. Foss., p. 220.
1869. *Orthis lunata* Davidson (part), Mon. Brit. Sil. Brach., Pal. Soc., p. 215, Pl. 28, figs. 1-5.
1913. *Dalmanella lunata* H. S. Williams (part), Proc. U.S. Nat. Mus., 45, p. 337, Pl. 30, figs. 1, 2, 4, 5.

This species, as noted by Sowerby, is very closely related to *Dalmanella lunata* (Sowerby) from which it differs in its almost circular outline and more pronounced median depression in the dorsal valve. This depression broadens anteriorly. It differs from *D. elegantula* and its variety *D. elegantula submedia* in the more depressed ventral valve.

With *D. lunata* it occurs in the Upper Ludlow and has been found by H. S. Williams in the Pembroke formation, Leighton cove, Maine.

Horizon and Locality. Rare in boulders found in Stonehouse field, probably from zone d of Stonehouse formation, Arisaig, N.S.

Type. Victoria Memorial Museum; plesioplastotype, Cat. No. 5409.

Genus, *Idiorthis* n. gen.

(*idios*, specialized)

A specialized line having some *Dalmanella* and *Rhipidomella* characters. Orbicular, short hinged, inequivalved; surface has rather coarse, angular striation. Ventral muscle area is like that of *Dalmanella*, not excavated and bounded laterally by high extensions of the dental lamellæ. In the dorsal valve, the median septum is stout, bearing on its posterior surface a large, elevated and trilobed cardinal process, recalling *Rhipidomella*. Unusual and specialized characters are the parallelism of the stout dental and crural plates, which more commonly diverge in both *Dalmanella* and *Rhipidomella*, and the reduction and peculiar position of the posterior adductor scars in the dorsal valve. The thick, erect, parallel crural plates and their well-developed lamellæ have encroached upon the area normally occupied by the posterior adductor scars, instead of diverging behind them. This has reduced the posterior adductors in size and forced them up on the truncated anterior face of the crural lamellæ, which, expanding laterally, curve around the postero-lateral borders of the greatly enlarged and almost circular anterior adductor scars. The above generic characters are based on a study of *Idiorthis matura* n. sp. A small species having a similar surface and outline, and antedating it in time, is also placed in this genus. Genotype, *Idiorthis matura* n.sp.

Idiorthis avita n. sp.

(*avitus*, ancestral)

Plate III, figure 18

This species resembles *Idiorthis matura* n.sp., of which it is probably the progenitor. It differs chiefly in size, being only about half as large; length 12 mm., width 14 mm. The hinge-line is longer and the dorsal valve a little more convex. The striation is like that of the posterior region of *I. matura*, both valves being ornamented with coarse subangular striæ, 14 per 10 mm. along the anterior margin. These striæ are like the coarse striæ of *I. matura*, but the finer intercalated striæ of that species are not present. The latter, however, are only introduced in the later growth stages of the more advanced species.

Horizon and Locality. Very rare in the Beechhill formation, Beechhill cove, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 425.

Idiorthis matura n.sp.

(*maturus*, mature)

Plate III, figures 19 to 24; Plate IV, figures 1 to 4; Plate XXVIII, figure 10

This species resembles *Dalmanella edgelliana* (Salter)[1], i.e., the ventral valve is moderately convex, the beak small and incurved, and the dorsal valve is slightly convex and has a slight median sinus, broadening anteriorly. The Arisaig species, however, is orbicular, not transverse; the maximum width is more than midway toward the anterior margin, and the hinge-line is shorter, a little less than half the width of the shell. Both valves are ornamented with coarse angular striæ which have a finer striation intercalated between each pair of coarser ones; 14 to 18 coarser striæ per 10 mm. The striæ do not tend to fasciculate as in *D. edgelliana*. The latter is not congeneric.

Length 25 mm., width 23 mm.

Horizon and Locality. Rare in zone b of the McAdam formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 426; paratype, Cat. No. 426a; paraplastotypes, Cat. Nos. 426b1, 426b2, 426c.

Family, RHIPIDOMELLIDAE Schuchert

Subfamily, **Rhipidomellinae** Schuchert

Genus, *Rhipidomella* Oehlert

1887. *Rhipidomys* Oehlert (not Wagner 1844), Fischer's Man. Conch., p. 1288.
1891. *Rhipidomella* Oehlert, Jour. Conch., p. 372.
1892. *Rhipidomella* Hall and Clarke, Pal. N.Y., 8, pt. 1, p. 209.
1913. *Rhipidomella* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 382.

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[1] Mon. Brit. Sil. Brach., Pal. Soc., p. 228, Pl. 32, figs. 1-4.

Striate, subcircular, biconvex, inequivalve orthids. The dorsal valve, deeper than the ventral. Shell structure punctate. Hinge-line short, cardinal area narrow. Ventral muscle area long, broad, flabelliform, and deeply impressed. Cardinal process stout, elevated, and trilobed. Genotype, *Terebratula michelini* L'Eveille.

Rhipidomella hybrida (Sowerby)?

1839. *Orthis hybrida* Sowerby, Murchison's Sil. Syst., p. 630, Pl. 13, fig. 11.
1897. *Rhipidomella hybrida* Schuchert, Bull. U.S. Geol. Surv., 87, p. 348 (full synonymy up to 1897 given here).
1915. *Rhipidomella hybrida* Bassler, Bull. U.S. Nat. Mus., 92, p. 1112 (full synonymy given here).

It is remarkable that this ubiquitous Silurian species is not more common at Arisaig. A single specimen of a dorsal valve may be of this species.

Horizon and Locality. Very rare in zone c of the McAdam formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University.

Genus, *Schizophorella* Reed

1917. *Schizophorella* Reed, Trans. Roy. Soc. Edin., 51, pt. 4, No. 26, p. 858.

Biconvex, inequivalve, dorsal the larger, transversely elliptical shells. Low dorsal fold and ventral sinus. Elongate, deeply impressed muscle scars; short dental plates. In the dorsal valve cardinal process prominent, lanceolate; crura stout and prominent; short stout septum. Genotype, *Orthis fallax* Salter.

Schizophorella arisaigensis n.sp.
Plate IV, figures 9 to 13

Inequivalve, somewhat transversely elliptical shells of medium size. Hinge-line short. Ventral valve has a poorly-defined sinus. Dorsal valve very convex, fold not pronounced. Ventral muscle area elongate and deeply cut, as in the genotype, and very long, greater than half the length of the shell. Dental plates short and rather thick. Interior of dorsal valve has a narrow, prominent cardinal process, a thick, short septum, and prominent crura. Surface covered with fine radiating striæ.

Length 15–17 mm.; width 15-20 mm.

Schizophorella mullockensis (Davidson)[1] is similar, but our species has a less well-developed dorsal fold and ventral sinus and the ventral muscle scars are proportionately much longer.

Horizon and Locality. Common at one horizon (90 feet above the base) in the Beechhill formation, on Rory McDonald brook, Arisaig, N.S.

Types. Peabody Museum of Yale University; holoplastotype, Cat. No. 477: Victoria Memorial Museum; paraplastotypes, Cat. Nos. 5411 to 5414.

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[1] Mon. Brit. Sil. Brach., Pal. Soc., p. 221, Pl. 29, figs. 14-18.

Superfamily, Strophomenacea Schuchert

Family, STROPHOMENIDAE King

Subfamily, **Rafinesquininae** Schuchert

Genus, *Leptaena* Dalman

1828. *Leptaena* Dalman, Kongl. Svenska Vet.-Akad. Handl. for 1827, pp. 93, 94.
1892. *Leptaena* Hall and Clarke, Pal. N.Y., 8, pt. 1, p. 276.
1913. *Leptaena* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 384.

Concavo-convex strophomenids. Margins more or less sharply deflected and radially striate. Remainder of surface radiately striate and concentrically wrinkled. Shell substance coarsely punctate. Genotype, *Productus rugosa* Hisinger = *Conchita rhomboidalis* Wilckens.

Leptaena rhomboidalis (Wilckens)

Plate IV, figure 14

1769. *Conchita rhomboidalis* Wilckens, Nachrict von selten Versteinerungen, p. 77, Pl. 8, figs. 43-44.
1852. *Leptaena depressa* Hall, Pal. N.Y., 2, p. 257, Pl. 53, figs. 6a-b.
1871. *Strophomena rhomboidalis* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 281, Pl. 39, figs. 1-21; Pl. 44, fig. 1; (synonymy for Europe to 1871 given here).
1892. *Strophomena rhomboidalis* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 188.
1897. *Leptaena rhomboidalis* Schuchert, Bull. U.S. Geol. Surv., 87, p. 240; (synonymy for North America to 1897).
1915. *Leptaena rhomboidalis* Bassler, Bull. U.S. Nat. Mus., 92, p. 710; (synonymy for North America to 1915).

Hall's Description of 1852. "Shell semioval or semicircular; hingeline equal to, or extending beyond the width of the shell; dorsal valve having the upper part nearly flat, slightly convex, or even concave, with strong concentric undulations, towards the margin abruptly inflected; ventral valve parallel to the dorsal valve, presenting a deep concavity. Surface marked by prominent radiating striæ.......

"The flatter portions of both valves are strongly marked by concentric undulations, which are crossed by finer striæ. On the deflected portion there are no undulations, the striæ alone marking the surface."

Horizon and Locality. Common in the Beechhill, Beechhill cove, very rare in zone c and common in zones d and e of the Ross Brook, very rare in zone a and rare in zone c of the McAdam, and rare in zones a and c of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 5415.

Genus, *Rafinesquina* Hall and Clarke

1892. *Rafinesquina* Hall and Clarke, Pal. N.Y., 8, pt. 1, p. 281.
1913. *Rafinesquina* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 384.

Dorso-ventrally concavo-convex strophomenids; hinge teeth, dental plates, deltidia, and chilidia present. Cardinal margin without denticulations. Ventral muscle area not delimited by extensions of the dental lamellæ. Genotype, *Strophomena alternata* Emmons.

Rafinesquina beechhillensis n.sp.

Plate IV, figure 15

This species is gently convex. It is a little wider than long, broadest at the hinge-line, and flattened in the cardinal angles. The lateral margins more or less converge. The dorsal valve is slightly concave. The angular striæ alternate in size and number 32 per 10 mm. on the anterior margin. In the interior of the ventral valve, the dental lamellæ are not produced around the border of the muscle area and no denticulations appear on the cardinal margin. The shell is of average size, length 12 mm., width 13 mm. *R. beechhillensis* n.sp., lacks the very prominent median "costa" of *R. mesicosta mesistria* Savage[1] and the oblique marginal folds of *B.* (?) *corrugata* (Conrad).[2]

Horizon and Locality. Very common in the Beechhill formation at Beechhill cove, and very rare in zones b and d of the Ross Brook and very rare in zone a of the McAdam formation, Doctor brook, Arisaig brook, and coast sections, Arisaig, N.S.

Type. Victoria Memorial Museum; holoplastotype, Cat. No. 5416a.

Genus, *Brachyprion* Shaler

1865. *Brachyprion* Shaler, Bull. Mus. Comp. Zool., 4, p. 63.
1913. *Brachyprion* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 385.

Structure intermediate between *Rafinesquina* and *Stropheodonta;* denticulations of the hinge-margin do not extend to the cardinal extremities; teeth and dental plates obsolescent; ventral muscle area broad, flabelliform, and bordered postero-laterally by extensions of the dental lamellæ. Genotype, *Strophomena leda* Billings.

A considerable departure from this structure is that shown by a small group of species, in which the ventral muscle area is narrow and subrectangular, not broad and flabelliform, and a median septal ridge is present, forking anteriorly and in some species bordering the anterior lobes of this area. In *B. ornatella* (Salter)[3] the branches of the median ridge curve around each diductor lobe and are continuous with the lateral bordering ridges, thus delimiting the anterior margin. In *B. gilpini* (Dawson) they either do not quite meet or the anterior margin is only weakly delimited. The median ridge of *B. shaleri* H. S. Williams[4] divides anteriorly, but the branches do not extend so far forward and the bordering ridges are not so prominent.

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[1] Bull. Geol. Surv., Ill., 23, 1913, p. 70, Pl. 4, fig. 6.
[2] Jour. Acad. Nat. Sci. Phil., 8, 1842, p. 256, Pl. 14, fig. 8.
[3] Mon. Brit. Sil. Brach., Pal. Soc., p. 309, Pl. 43, figs. 16-20.
[4] Proc. U.S. Nat. Mus., 45, 1913, p. 329, Pl. 29, figs. 10 to 12.

Brachyprion mertoni n.sp.

Plate IV, figures 16 to 18; Plate XXVIII, figure 12

The size is larger and the surface is more convex than in *Rafinesquina beechhillensis* n.sp., particularly in the anterior part where the surface of the ventral valve is geniculated and bends dorsally through an angle of 40 degrees to 60 degrees; this geniculate marginal area decreases in width posteriorly; the surface of the valve flattens toward the cardinal angles which are a little extended; lateral margins rounded and converging anteriorly, giving a subtriangular outline to the shell. The inbending of the marginal surface is not abrupt, e.g., as in *Brachyprion philomela* (Billings)[1], but even and gradual; although moderately convex, the gibbosity of the ventral valve is not to be compared with that of *B. philomela* (Billings), *B. profunda* (Hall)[2], *B. imbrex* var. *semiglobosa* (Davidson)[3], and other highly convex Silurian species. The ventral muscle area is divided by a median septal ridge as in *B. plana* Foerste.[4] The dorsal valve is almost flat posterially and concave on the anterior and lateral borders. Striæ alternate as in *B. beechhillensis*, 30-35 striæ per 10 mm. on the anterior margin, but are coarser. The only variation from the form described above is that shown by a few specimens that are slightly transverse and more evenly convex. In the structure of the ventral muscle area, this species closely resembles *B. plana* Foerste, but the shell of that species is transverse, more evenly convex, and the striæ more equal. This species is named for Dr. Merton Y. Williams, investigator of Arisaig geology.

Length 23-28 mm., width 20–24 mm.

Horizon and Locality. Very rare in zone b of the McAdam and common in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 5417; paratype, Cat. No. 5418; paraplastotype, Cat. No. 5419a.

Brachyprion gilpini (Dawson)

Plate V, figures 28, 29

1881. *Strophomena gilpini* Dawson, Can. Nat., n. ser., 9, p. 341.
1897. *Stropheodonta* (?) *gilpini* Schuchert, Bull. U.S. Geol. Surv., 87, p. 422.
1915. *Stropheodonta* (?) *gilpini* Bassler, Bull. U.S. Nat. Mus., 92, p. 1223.

Original Description. "Shell, when full grown, nearly an inch in diameter; length and breadth nearly equal; hinge-line equal to breadth; valves little elevated; hinge area narrow. Surface marked with numerous fine, radiating, elevated lines, between which others are introduced as they diverge from the beak. When the surface is well preserved microscopic concentric striæ are seen to cross the radiating lines, and where the outer surface is removed, the structure of the shell appears punctate. Muscular impressions oval, elongate, and narrow. This shell is very abundant near the Sutherland River ore bed . . in general form and the style of the muscular impressions resembles *S. ornatella* of Salter from the Upper Ludlow of Britain, though it has finer and sharper superficial sculpture."

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[1] Can. Nat. Geol., 5, 1860, p. 56, figs. 4, 5.
[2] Pal. N.Y., 2, 1852, p. 61, Pl. 21, figs. 4, 5.
[3] Mon. Brit. Sil. Brach., Pal. Soc., p. 286, Pl. 41, figs. 1-6.
[4] Jour. Cinn. Soc. Nat. Hist., 21, 1909, p. 22, Pl. 1, figs. 13 a-c;Pl. 2, figs. 11 a, b.

The above species can be distinguished from *Brachyprion mertoni* n.sp., by its more even and moderate convexity, relatively shorter length of shell, finer and more even striation, narrower ventral muscle scars, and the forking, anteriorly, of the median septal ridge. The resemblance, structurally, to *B. ornatella* (Salter) and *B. shaleri* H. S. Williams has already been discussed. The ventral valve of *B. shaleri* is more depressed than that of *B. gilpini* or *B. ornatella.* The anterior border of the ventral muscle area of *B. gilpini* is not so strongly delimited as that of *B. ornatella.* The relation to the latter species is very close, however.

Length 14 mm., width 20 mm.

Horizon and Locality. Common in zone a and rare in zones b-c of the Stonehouse, coast section; rare in zone d of the Stonehouse, Stonehouse brook, Arisaig, N.S. *B. ornatella* is confined to the Upper Ludlow of Great Britain.

Types. Victoria Memorial Museum; plesiotype, Cat. No. 5420; plesioplastotype, Cat. No. 5420a; plesiotype, Cat. No. 5421: McGill University coll.; lectotype, Cat. No. 248.

Brachyprion (?) *honeymani* n.sp.
Plate V, figure 30

A small, somewhat transverse species; length 8 mm., width 12 mm.; cardinal extremities auriculate; anterior margin broadly rounded, lateral margins rounded; ventral valve moderately convex in posterior region, but highly arched and deflected dorsally in the anterior part. The surface is ornamented with coarse, angular striæ, alternating with single intercalated finer and angular striæ. Dorsal valve not known. In size and outline, this species resembles *Brachyprion leda* (Billings),[1] but is about one-third larger and more transverse; cardinal extremities not produced into a spiniform process as in *B. leda;* differs from *B. mertoni* in its smaller size, transverse, not elongate, outline, and greater proportional convexity. Immature shells of *B. mertoni* of the size of *B.* (?) *honeymani* are slightly elongate, only gently convex, and lack the deflexion of the anterior border.

Horizon and Locality. Only three specimens have been collected. One is from Cameron brook, Sutherland river, horizon not known; two are from zone c of the Stonehouse formation, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 433.

Genus, *Amphistrophia* Hall and Clarke

1892. *Amphistrophia* Hall and Clarke, Pal. N.Y., 8, pt. 1, p. 292.
1913. *Amphistrophia* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 385.
1914. *Strophoprion* Twenhofel, Bull. Victoria Mem. Mus., 3, p. 25.
1916. *Amphistrophia* Holtedahl, The Strophomenidae of the Kristiania Region, p. 63.

Resupinate strophomenids in which the denticulations of the cardinal border do not extend to the cardinal extremities. These shells may also be described as resupinate *Brachyprion.* Genotype, *Strophonella striata* Hall.

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[1] Can. Nat. Geol., 5, 1860, p. 55, text figs. 2, 3.

Amphistrophia arisaigensis n.sp.
Plate V, figure 31

A single specimen of the exterior of a dorsal valve is preserved. The size is about one-half that of *Amphistrophia funiculata* (McCoy)[1] and the outline transverse, but not so much so as in that species; length 8 mm., width 11 mm. Posterior surface slightly concave, anterior and lateral surface convex and deflected ventrally, but not so abruptly as in *A. funiculata;* cardinal extremities slightly produced, but not pronouncedly mucronate; lateral margins rounded and slightly converging anteriorly; anterior margin broadly rounded. The surface sculpture is very distinctive; fine, raised, practically parallel striæ radiate in pairs and are widely spaced, about 0·05 mm.; in the interspace between each pair lies a single stria which originates about midway from the umbo by intercalation, and tends to pair by bifurcation before reaching the anterior margin; surface between the striæ thrown into scalloped concentric corrugations, convex posteriorly; surface smooth along the cardinal margin and in the cardinal angles. In *A. funiculata* the striæ are equal to somewhat unequal, closely spaced, and are not paired; corrugations are lacking. *A. geniculata* (Shaler)[2] is larger, not corrugated, and the striæ are not paired.

Horizon and Locality. Very rare, horizon not known, but probably from the Stonehouse formation, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5422.

Subfamily, **Orthotetinae** Waagen
Genus, *Schuchertella* Girty

1904. *Schuchertella* Girty, Proc. U.S. Nat. Mus., 27, p. 734.

Concavo-convex to biconvex strophomenids; narrow dorsal area. Rudimentary dental plates and crural lamellæ not produced around the border of the dorsal muscle area. Cardinal process united to crural plates, forming a crescent-like protuberance. Genotype, *Streptorhynchus lens* White.

Schuchertella pecten (Linnaeus)
Plate V, figure 32

1767. *Anomia pecten* Linnaeus, Syst. Nat., ed. 12, 1, pars. 2, p. 1152.
1871. *Strophomena pecten* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 304, Pl. 43, figs. 1-11 (synonymy for Europe to 1871).
1915. *Schuchertella pecten* Bassler, Bull. U.S. Nat. Mus., 92, p. 1150 (synonymy for North America to 1915).

Davidson's Description of 1871. "Shell transversely semicircular, broadish at its long, straight hinge-line, sides and front rounded; cardinal extremities forming, with the lateral portions of the valve, sharp acute angles. Valves much compressed. Ventral valve slightly convex at the beak, but becoming gradually and gently concave as it approaches the margin; area triangular, of moderate width; fissure in the middle arched over by a pseudo-deltidium; beak very small, scarcely projecting. Dorsal valve slightly convex, and flattened near its cardinal extremities: hinge-area linear, but with a small corresponding pseudo-deltidium in the middle, so that the two, when combined, form a lozenge-shaped arch . . . Valves covered with numerous, thread-like, radiating, nearly equal ribs, which increase rapidly in number by the insertion of one or two additional and finer radii in the interspace left between each pair of larger ones; the whole surface is likewise crossed by numerous equidistant, slightly projecting, concentric ridges or lines of growth. In the interior of the dorsal valve a small bifid cardinal process is situated between two slightly projecting brachial (?) processes; a short median ridge separates the obscurely marked muscular impressions. In the interior of the ventral valve the muscular impressions are scarcely defined."

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[1] Sil. Foss. Ireland, p. 30, Pl. 3, fig. 11, 1846.
[2] Bull. Mus. Comp. Zool., 1, 1865, p. 63.

At Arisaig this species is very rare and somewhat below the average size. Average length 12 mm., average width 19 mm.

Horizon and Locality. Very rare in zones b, d, and e of the Ross Brook and very rare in zone a of the Stonehouse formation, coast section, Arisaig, N.S. Common in a small collection from Doctor brook, horizon not known, but probably from the Ross Brook.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 5423.

Family, PRODUCTIDAE Gray
Subfamily, **Chonetinae** Waagen
Genus, *Chonetes* Fischer de Waldheim

1837. *Chonetes* Fischer de Waldheim, Oryct. Gouv. Moscow, pt. 2, pp. 134, 193, Pl. 26, figs. 8, 9.
1892. *Chonetes* Hall and Clarke, Pal. N.Y., 8, pt. 1, p. 303.
1913. *Chonetes* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 389.

Concavo-convex to plano-convex productids; a row of hollow spines on the upper margin of the ventral cardinal area; strong cardinal teeth; ventral muscle area divided by a low median ridge. Shell structure fibrous-punctate. Genotype, *Orthis striatella* Dalman.

Chonetes tenuistriatus Hall
Plate V, figures 33, 34

1860. *Chonetes tenuistriata* Hall, Can. Nat. Geol., 5, p. 145, fig. 3.
1868. *Chonetes tenuistriata* Dawson, Acadian Geol., 2d. ed., p. 596, fig. 200.
1892. *Chonetes tenuistriata* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 187.
1897. *Chonetes tenuistriatus* Schuchert, Bull. U.S. Geol. Surv., 87, p. 179.
1915. *Chonetes tenuistriatus* Bassler, Bull. U.S. Nat. Mus., 92, p. 219.

Original Description. "Shell semi-oval, twice as wide as long; ventral valve moderately convex, hinge-line equalling the width of the shell; surface marked by fine, even, closely arranged striæ, which apparently increase only by interstitial additions, and are not flexuous. The number of striæ on the margin of the shell is nearly 100.

"This species is more finely striated than the preceding, the striæ not flexuous, more even, and in shells of equal size much more numerous. This species is somewhat larger and more closely striated than the *C. cornuta* of the Clinton group of New York."

C. cornutus Hall of the Clinton formation is very close and differs chiefly in its smaller size and somewhat lower convexity. The finer striation of these two species is to be contrasted with the coarser striation of the later Silurian species *C. striatellus* (Dalman)[1] and *C. novascoticus* Hall. *C. tenuistriatus* resembles *C. cornutus*[2], *C. novascoticus*, and *C. cobscooki* H. S. Williams[3] in the not uncommon presence of a stronger and thicker median stria on the ventral valve. Striæ 50 per 10 mm. on the anterior margin. Outline, twice as wide as long to somewhat less transverse; length 7-8 mm., width 10-14 mm.; a few smaller specimens almost as long as wide. Ventral valve, on the average, more convex than in *C. cornutus*, but never attaining the convexity of the more gibbous forms of *C. striatellus.*

Horizon and Locality. Very rare in zone c, very common in zones d and e of the Ross Brook, and very common in zones b and c of the McAdam formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; plesiotype, Cat. No. 434.

Chonetes novascoticus Hall
Plate V, figures 35, 36; Plate VI, figure 1

1860. *Chonetes novascoticus* Hall, Can. Nat. Geol., 5, p. 144, fig. 2.
1860. *Chonetes novascoticus* Dawson, Acadian Geol., Suppl. chap., p. 68, fig. 48.
1868. *Chonetes novascoticus* Dawson, Ibid., 3d. ed., p. 595, fig. 199.
1892. *Chonetes novascotica* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 187.
1897. *Chonetes novascoticus* Schuchert, Bull. U.S. Geol. Surv., 87, p. 177.
1915. *Chonetes novascoticus* Bassler, Bull. U.S. Nat. Mus., 92, p. 219.

Original Description. "Shell semielliptical, width varying from once and a half to nearly twice the length. The ventral valve variably convex, and often showing a flattened or slightly concave space down the middle of the shell; cardinal margin ornamented by four or five minute spines on each side of the beak; cardino-lateral margins often a little wrinkled; surface finely striated, striæ flexuous, dichotomising and increasing by interstitial addition, so that there are more than one hundred on the margin of the shell; striæ increasing in size below the umbo; concentric striæ fine, close, rounded, and slightly undulating.

"Dorsal valve moderately concave; striæ much stronger below the middle of the shell and sometimes bifurcating toward the margin.

" . . . A stronger and more elevated stria often marks the median line from beak to base of the ventral valve."

This species closely resembles *Chonetes striatellus* (Dalman), from which it differs in the development of a stronger median stria on the ventral valve and even the largest shells do not attain the convexity of the more gibbous forms of that species. The outline is, on the average, more transverse than Hall's figure indicates and is similar to that of *C. striatellus* and *C. bastini* H. S. Williams;[4] the width varies from twice the length to somewhat less. The striation is coarser than that of *C. tenuistriatus* Hall and *C. cornutus* Hall of the earlier Silurian and about equal to that of *C. stria-*

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[1] Kgl. Svens. Vet.-Akad. Handl., 1828, p. 111, Pl. 1, fig. 5.
[2] Pal. N.Y., 1852, 2, p. 64, Pl. 21, fig. 10.
[3] Proc. U.S. Nat. Mus., 45, 1913, p. 327, Pl. 29, fig. 5.
[4] Proc. U.S. Nat. Mus., 45, 1913, p. 337, Pl. 30, figs. 6, 7, 10.

tellus and *C. bastini;* striæ 30-37 per 10 mm. The presence of a strong median stria (which, however, is not present in all specimens) is a resemblance to *C. cornutus*, *C. tenuistriatus*, and *C. cobscooki* H. S. Williams. The marginal spines are on the average greater in number than in *C. striatellus*, less than in *C. bastini*, and about equal to those in *C. cobscooki.* The last is probably less convex than *C. novascoticus* of the same size, but the two species must be very similar. *C. bastini* is also a very closely related species and best compared with the larger specimens in the upper part of the Stonehouse, but it does not in any specimens have a strong median stria.

There is considerable mutation in size, as shown in the following table:

Moydart		18 × 9 mm. to 26 × 14 mm.
Stonehouse	base to 360 ft.	8 × 4 mm. to 11 × 6 mm. temporary mutation at 360 ft. to 18 × 11 mm.
	360 ft. to 540 ft.	8 × 4 mm. to 11 × 6 mm.
	540 ft. to 680 ft.	11 × 7 mm. to 17 × 10 mm.
	680 ft. to 920 ft.	14 × 9 mm. to 21 × 13 mm.
	920 ft. to top	20 × 11 mm. to 32 × 16 mm.

Thus, beginning with large specimens in the Moydart, *C. novascoticus* suffered dwarfing in the lower part of the Stonehouse, but gradually recovered, and in the upper beds not only attained its former size, but surpassed it.

Horizon and Locality. Very common in zone a of the Moydart, and very common in zones a to c of the Stonehouse, coast section; very common in zone d, Stonehouse brook, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotype, Cat. No. 5424: Peabody Museum of Yale University; plesiotypes, Cat. Nos. 435, 436.

Chonetes novascoticus mut. *crassistriatus* n. mut.

(*crassus*, coarse)

Plate V, figure 37

The striæ of *Chonetes tenuistriatus* Hall are spaced 50 per 10 mm., and those of *C. novascoticus* Hall, 36 per 10 mm., on the anterior margin. A few specimens in the talus of Stonehouse field, and evidently from the upper part of the Stonehouse formation, have a still coarser sculpture and may represent a culmination of evolution from fine to coarse striæ. Two have the striæ spaced 18 per 10 mm., another 20 per 10 mm., and a fourth 25 per 10 mm. They are moderately convex, and have an outline similar to *C. novascoticus*, but are smaller than the average size of that species; width 18 mm., length 10 mm. The only other occurrence of coarse striation is that of two specimens in shale picked up on the shore, near the exposures of the lower Moydart. On account of the hundreds of specimens of normally striated *C. novascoticus* that follow, throughout both the Moydart and Stonehouse formations, these two specimens can only be regarded as "sports." The coarsely striated specimens, however, which appear to have come from the upper part of the Stonehouse, may well be something more permanent and are distinguished as mut. *crassistriatus*. Whatever the status of these forms may be, they are prophetic of the coarsely striated *Chonetes* of the Devonian. This does not necessarily mean that they are directly ancestral to the Devonian species, but does suggest that the latter may be an outcome of the Silurian evolution. Mut. *crassistriatus* is most suggestive of a Devonian line of development represented by a small undescribed species in the Lower Helderberg and *C. mucronatus* (Hall)[1] of the Oriskany. Compared with the latter, however, it is twice as large, more transverse, and lacks the mucronation. It does not show the anterior curvature of the striæ of *C. jerseyensis* Weller[2].

Horizon and Locality. Very rare in talus from Stonehouse field and probably from zone d of the Stonehouse formation, Stonehouse brook, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5425.

Order, **Telotremata** Beecher
Superfamily, Rhynchonellacea Schuchert
Family, RHYNCHONELLIDAE Gray
Subfamily, **Rhynchotreminae** Schuchert
Genus, *Rhynchotreta* Hall

1879. *Rhynchotreta* Hall, 28th Rept. N.Y. State Mus., p. 166, text figs. 1-4.
1893. *Rhynchotreta* Hall and Clarke, Pal. N.Y., 8, pt. 2, p. 185.
1913. *Rhynchotreta* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 397.

Trihedral, plicate rhynchonellids; septal cardinal process.

The linear cardinal process, as in all the Rhynchotreminae, lies in the median line and rests on the median septum. The distinction between it and a bifid process formed by a modification of the hinge-plate, as in *Uncinulus, Plethorhyncha,* and *Eatonia,* should be emphasized. Hall and Clarke[3], although recognizing the crural origin of the "cardinal process" in *Uncinulus,* use it, together with the general form and cemented teeth, as an argument for a derivation of that genus out of *Rhynchotrema.* But a "cardinal process" so derived, loses the genetic significance of one of septal origin. As regards form, *Uncinulus* may resemble *Rhynchotrema capax* (Conrad), but this is a terminal and side line of *Rhynchotrema* development, through *R. increbescens* (Hall). The resemblance is the result of a similar excrescence of growth. A lamellose species like *R. capax* could not give rise to *Uncinulus,* which is not thus ornamented. The main line of *Rhynchotrema* evolution is through the more generalized species like *R. minnesotensis* (Sardeson), etc. In the Silurian, the subfamily is represented by species of the genus *Rhynchotreta* including *R. borealis* (Davidson) of English faunas. The Devonian species *Rhynchonella ? lamellata* Hall probably falls in this subfamily. It has a divided hinge-plate and a median septum between, which may function as a cardinal process. Genotype, *Rhynchonella cuneata* Dalman.

Rhynchotreta robusta (Hall)?

Compare with:
1852. *Atrypa robusta* Hall, Pal. N.Y., 2, p. 71, Pl. 23, fig. 7.
1915. *Rhynchotreta robusta* Bassler, Bull. U.S. Nat. Mus., 92, p. 1127 (see for full synonymy).

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[1] Pal. N.Y., 4, 1867, p. 124, Pl. 20, fig. 1; Pl. 21, fig. 1.
[2] Geol. Surv., N.J., Pal., 3, p. 230, Pl. 20, figs. 11-16.
[3] Pal. N.Y., vol. 8, pt. 2, p. 299.

Two specimens of the ventral valve embedded in shale resemble *Rhynchotreta robusta* (Hall); the plications are coarse and somewhat rounded, but are a few more in number; the outline is not quite so acute posteriorly. The shape of the beak is not preserved in the Arisaig species or in Hall's figures. In *Rhynchotreta* it is characteristically upright, exposing the deltidial plates. The interior is not known. The general outline, however, is characteristic of the genus.

Horizon and Locality. Very rare in two specimens from zone d of the Ross Brook formation, coast section, Arisaig, N.S.

Type. Yale University.

Subfamily, **Rhynchonellinae** Gill

Genus, *Camarotoechia* Hall and Clarke

1893. *Camarotoechia* Hall and Clarke, Pal. N.Y., 8, pt. 2, p. 189.
1913. *Camarotoechia* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 397.
1914. *Camarotoechia* Weller, Mon. State Geol. Surv., Ill., 1, p. 175.

Plicated rhynchonellids, in which the dorsal median septum divides posteriorly, each branch supporting one of the divisions of the hinge-plate, and forming an elongate cavity, not extending to the bottom of the valve. In the ventral valve the teeth are supported by dental plates which extend into the valve and enclose the postero-lateral border of the characteristically narrow, deep, muscle scar. Genotype, *Atrypa congregata* Conrad.

The genus *Camarotoechia* is interpreted as the main primitive line of the Rhynchonellinae, extending from the Ordovician into the Carboniferous. From time to time it gave off numerous lateral stocks, of both long and short duration. These arose from the parent stem by modifications of the hinge-plates, muscle scars, median septum, dental plates, etc., by addition of internal plates to form buttresses, and by changes in ornamentation of diagnostic value. The relations of these derived lateral stocks will be discussed under various genera.

Two genera, *Uncinulus* Bayle and *Eatonia* Hall, usually referred to the Rhynchotreminæ, are here placed in the Rhynchonellinæ. The so-called cardinal process is not homologous with that of the typical Rhynchotreminae, i.e. it is not a linear process lying on the median septum, but a bifid process formed by a great elevation, thickening, and union of the divided hinge-plates of the *Camarotoechia* dorsal interior.

A small group of lamellose *Camarotoechia* is left in this genus. It includes *C. lewisi* Davidson, *C. leightoni* H. S. Williams, and *C. squamifera* n. sp. To make a new genus for them seems like going to the extreme in genus-making. They should not be confused with *R ? lamellata* Hall, which, if a Rhynchonellid, is of the. subfamily Rhynchotreminae. It certainly is not of the Rhynchonellinae.

The Arisaig species may be classified as follows:

Species of the normal genus:
- *Camarotoechia bimesiornata* n. sp.; in the Beechhill
- *C. nucula* var. *planorugosa* n. var.; McAdam to Stonehouse
- *C. nucula* mut. *moydartensis* n. mut.; in the Moydart
- *C. llandoveriana* var. *rossonia* n. var.; in the Ross Brook
- *C. marklandensis* n. sp.; in the Stonehouse
- *C. glomerosa* n. sp.; in the Stonehouse

Group of C. lewisi:
- *C. squamifera* n. sp.; in the Moydart and Stonehouse

Camarotoechia bimesiornata n.sp.

(*bis*, twofold; *mesa*, middle; *ornatus*, adorned)
Plate V, figures 1-5; Plate XXX, figure 9

Like *Camarotoechia whitei* (Hall)[1], this species has two plications in the fold and one in the sinus. The posterior square-shouldered outline, however, is different, the cardinal slopes are not so steep, the outline is a little more transverse, and the plications on the fold are not angular and equal in size to those on either side, but more obtusely rounded and stouter. Although the surface is not well preserved, some specimens appear to be finely lamellose. *C.* (*?*) *bidens* (Hall)[2] is not so transverse in outline and the plications are all about equal in size. *Plagiorhyncha decemplicata* (Sowerby) is more rounded in outline and differs in internal structure.

Width 11 mm., length 9 mm.

Horizon and Locality. Common in the Beechhill formation, on Rory McDonald brook, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 5426; paratypes, Cat. Nos. 5427, 5428; paraplastotype, Cat. No. 5427a.

Camarotoechia nucula var. *planorugosa* n.var.

(*planus*, flat; *rugosus*, folded)
Plate V, figures 6 to 8

1892. *Rhynchonella neglecta* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 188.
Species Reference:
1839. *Terebratula nucula* Sowerby, Murchison's Sil. Syst., p. 611, Pl. 5, fig. 20.
1839. *Terebratula neglecta* Sowerby (not Hall), Ibid., p. 641, Pl. 21, fig. 14.
1871. *Rhynchonella nucula* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 181, Pl. 24, figs. 1-7.

The North European species *Camarotoechia nucula* (Sowerby)[3] is very closely related to *C. neglecta* (Hall)[4] (non Sowerby) of North American interior faunas. A considerable number of specimens in each species cannot be separated from one another. As the name *neglecta* was applied by Sowerby in 1839 to a fragment of *C. nucula*, Hall's species should be given a new name. Compared with *C. nucula*, Hall's species is, on the average, less transverse, has steeper cardinal slopes, and has a flatter and straighter dorsal fold. The Arisaig variety differs from *C. nucula* in much the same manner; the dorsal fold is flat and straight and in full grown specimens even more so than in *C. neglecta;* it lacks the somewhat acute posterior outline that some specimens of *C. neglecta* show.

Width 9 mm., length 8 mm.

Horizon and Locality. Rare in zone a, common in zones b and c of the McAdam, common in zone a of the Moydart, and common throughout the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 429.

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[1] 11th Rept. State Geol. Indiana, 1882, p. 307, Pl. 26, figs. 23-33.
[2] Pal. N.Y., vol. 2, 1852, p. 69, Pl. 23, fig. 3.
[3] Mon. Brit. Sil. Brach., Pal. Soc., p. 181, Pl. 24, figs. 1-7.
[4] Pal. N.Y., 2, 1852, p. 70, Pl. 23, fig. 4; p. 274, Pl. 57, fig. 1.

Camarotoechia nucula mut. *moydartensis* n. mut.

Plate V, figures 9 to 11

In the Moydart, all gradations exist between the typical *Camarotoechia nucula* var. *planorugosa* n. var., and a more globose shell in which the plications are less sharp, and the fold is less prominent, and not so flat.

Horizon and Locality. Common in zone a of the Moydart, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5429.

Camarotoechia llandoveriana var. *rossonia* n. var.

(*Rossonia,* a Latinized form of formation name Ross Brook)

Plate V, figures 12 to 14; Plate X, figure 9

1892. *Rhynchonella aequiradiata* Ami, Trans. N.S. Inst. Sci.,ser. 2, 1, p. 188.
Species Reference:
1871. *Rhynchonella llandoveriana* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 184, Pl. 24, figs. 8-13.

This shell belongs to a small group of multistriate *Camarotoechia,* very typical of the Clinton and its equivalents, including *C. llandoveriana* (Davidson)[1], *C. weaveri* (Salter)[2] and *C. aequiradiata* (Hall).[3] It is considered to be a variety of the first.

Specimens of *C. aequiradiata* from New Hartford, N.Y., are on the average more transverse than Hall's figures indicate and mature forms have a slightly developed fold and sinus which begin to appear at half size or later; the plications vary from 24 to 32 and average 26 to 28; the plications on the fold vary from 5 to 8. Compared with this, *C. llandoveriana* var. *rossonia* n. var., is somewhat larger, more transverse, and the fold and sinus, beginning about midway from the beak, are better developed; the total number of plications is, on the average, more numerous, varying from 26 to 38, and averaging 32 to 34; the plications on the fold vary from 5 to 8. Though these two forms overlap considerably in variation, the prominent fold and sinus of the Arisaig specimens constantly distinguish them. Davidson's description of *C. llandoveriana* indicates that it is very close to the Arisaig specimens. The outline is transverse, the fold and sinus begin midway from the beak, and each contains 7 to 8 plications. The total number of plications, 35, is not far from the average of the Arisaig variety. *C. weaveri* (Salter) has a more elongate, acute outline and only a poorly developed fold and sinus.

Horizon and Locality. Very common in zone d of the Ross Brook, coast section, Arisaig, N.S. *C. llandoveriana* and *C. weaveri* are characteristic of the Upper Llandovery of Ireland, Scotland, and England. In the Christiania section *C. weaveri* is found in etage 6b of Kiaer.

Types. Victoria Memorial Museum; holotype, Cat. No. 5430; paratype, Cat. No. 5431: Peabody Museum of Yale University; paratype, Cat. No. 430.

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[1] Mon. Brit. Sil. Brach., Pal. Soc., p. 184, Pl. 24, figs. 8-13.
[2] Mon. Brit. Sil. Brach., Pal. Soc., p. 185, Pl. 24, fig. 14.
[3] Pal. N.Y., vol. 2, 1852, p. 70, Pl. 23, fig. 5.

Camarotoechia marklandensis n.sp.
(*Markland,* Nova Scotia in Scandinavian legend)
Plate V, figures 20 to 22

This species resembles *Camarotoechia llandoveriana* (Davidson), but has somewhat fewer plications, averaging 24; it is larger, and the fold and sinus are not so definitely demarcated; the fold is raised and rounded, but not abruptly marginated as in *C. llandoveriana,* and the sinus is only a broad, shallow depression. The plications grow coarser anteriorly, where they are high, narrow, and rib-like.

Average width 12 mm., average length 11 mm. One specimen of a dorsal valve is 18 mm. wide and 16 mm. long.

Horizon and Locality. Very rare in zones a and c of the Stonehouse formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; paratype, Cat. No. 5432: Peabody Museum of Yale University; holotype, Cat. No. 431.

Camarotoechia glomerosa n.sp.
(*glomerosus*, round)
Plate V, figures 15 to 19

Some forms of this variable species suggest *Wilsonia wilsoni* (Sowerby)[1]. The dental lamellæ extend prominently into the valve, however, and the anterior plications are not divided by a median line. The outline is circular to subcircular, the plications are numerous, 20 to 24, and the fold and sinus are confined to near the anterior border. There are uniformly 4 plications on the fold, and 3 on the sinus. The plications are angular to obtuse, the angular being more common in the earlier stages of growth. There is some variation in convexity, but both valves are very convex and equally so. In a few shells, the anterior and lateral margins are flattened.

Length 11 mm., width 11 mm.

Horizon and Locality. Very common in zone c of the Stonehouse, coast section, and very rare in zone d of the same formation, on Stonehouse brook, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5433.

Camarotoechia squamifera n.sp.
(*squamifer*, scaly)
Plate V, figures 23 to 27; Plate XXVIII, figure 7

This species resembles *Camarotoechia lewisi* (Davidson)[2] in the transversely oval outline, the abruptly marginated fold and sinus, and the lamellose surface. It is, however, a more gross shell, the dorsal valve is relatively more convex, and the plications are coarser and, on the average, fewer in number, 16 to 18. The size is somewhat larger, width 20 mm., length 14 mm. In *C. leightoni* H. S. Williams[3] the lamellæ are confined to the anterior region and the mesial fold lacks the abrupt margins, and the consequent "pinched" appearance.

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[1] See Pal. N.Y., vol. 8, pt. 2, p. 198.

[2] Mon. Brit. Sil. Brach., Pal. Soc., p. 180, Pl. 23, figs. 25-28.

[3] Proc. U.S. Nat. Mus., vol. 45, 1913, p. 338, Pl. 30, figs. 9, 11-13.

Examination of the dorsal and ventral interiors of both this species and *C. lewisi* reveals the characteristic *Camarotoechia* features: each unit of the divided plate is supported by divisions of the median septum, forming a crural cavity, and in the ventral valve the teeth are supported by dental plates as in *Camarotoechia.* The problematic Devonian species *Rhynchonella ? lamellata* Hall[1] is very different, having a Rhynchotreminid dorsal interior; hinge-plate divided, median septum possibly functioning as a cardinal process posteriorly, and no crural cavity.

Horizon and Locality. Common in zone a of the Moydart and very rare in zone a of the Stonehouse formation, coast section, Arisaig, N.S. *C. lewisi* is characteristic of the Wenlock of England, and *C. leightoni* is found in the Pembroke formation at Leighton cove, Maine.

Types. Peabody Museum of Yale University; holotype, Cat. No. 432; paratype, Cat. No. 476.

Genus, *Pectorhyncha* McLearn

1918. *Pectorhyncha* McLearn, Am. Jour. Sci., 45, p. 137.

Obtusely plicated rhynchonellids; teeth cemented to the lateral walls of the ventral valve; dorsal median septum prominently elevated and posteriorly thickened as in *Plethorhyncha.* Regarded as possibly ancestral to that genus. Genotype, *Atrypa obtusiplicata* Hall.

The characters of this genus are typified by *Pectorhyncha obtusiplicata* (Hall). In the Arisaig specimens of this species, the dental plates are variably developed, but even where extended into the valve they do not support the teeth, but, curving laterally, become attached to the walls of the ventral shell. The teeth are longitudinally grooved. The hinge-plate and crura are somewhat thickened, as in *Plethorhyncha.* The genus differs from all other members of the *Wilsonia-Plethorhyncha* group, however, in lacking the median short line on the anterior part of the plications. The ventral muscle area is narrow as in *Camarotoechia,* and not broad as in *Wilsonia.* The same characters are incipiently developed in *P. antiqua* n. sp., which precedes it in time and which is structurally intermediate between it and *Camarotoechia.* In some specimens of *P. antiqua,* the teeth project into the valve from a narrow and poorly developed cardinal area, and are supported by slightly projecting dental plates, as in *Camarotoechia.* In other specimens the tooth lies on the wall and the dental lamellæ do not project from the shell of the rostral cavity. The dorsal median septum is not so prominent and the crura are more slender than in *Pectorhyncha obtusiplicata.* These species illustrate two stages that a genus like *Plethorhyncha* would pass through in a derivation from *Camarotoechia.*

Pectorhyncha antiqua n.sp.

(*antiquus,* old)

Plate VII, figures 1 to 12; Plate XXIX, figures 1, 5

This is a small globose shell, having low depressed plications, and resembling *Pectorhyncha obtusiplicata* (Hall)[2] which it antedates. The size is much smaller, length 10 mm., width 11 mm., depth 7 mm. The total number of plications is a little less, 18. There are uniformly 4 on the fold and 3 in the sinus as in Hall's species. The fold and sinus are not so prominent, however, and the plications are more nearly flat, especially on the fold and sinus.

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[1] Pal. N.Y., vol. 2, 1852, p. 329, Pl. 74, fig. 11.

[2] Pal. N.Y., vol. 2, 1852, p. 279, Pl. 58, fig. 2.

Horizon and Locality. Very common in zone e of the Ross Brook formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 437; paratype, Cat. No. 437b; paraplastotypes, Cat. Nos. 437a, 437c.

Pectorhyncha obtusiplicata (Hall)

Plate VII, figures 13 to 15, 18 to 20; Plate XXIX, figure 3; Plate XXX, figures 5, 8

1852. *Atrypa obtusiplicata* Hall, Pal. N.Y., 2, p. 279, Pl. 58, fig. 2.
1897. *Camarotoechia obtusiplicata* Schuchert, Bull. U.S. Geol. Surv., 87, p. 107.
1915. *Camarotoechia obtusiplicata* Bassler, Bull. U.S. Nat. Mus., 92, p. 177 (see for complete synonymy).

Original Description. "Spheroidal, or more or less gibbous; ventral valve extremely convex; beak of dorsal valve small, closely incurved over the ventral valve; surface plicated; plaits simple, rounded, about 18 to 20, three or four of which are depressed in the dorsal valve and projecting in front, filling a deep sinus in the margin of the ventral valve, a corresponding elevation on the ventral valve, which reaches from the base two-thirds of the way to the beak; plications crossed by fine subimbricating concentric striæ.

"This shell is easily distinguished from the other species of this group by its rounded form and obtuse plications in the perfect shell, which are subangular in the cast."

At Arisaig, although the specimens are somewhat crushed, they show the obtuse plications and concentric striæ. Where there is evidence of a fold and sinus, 4 plications appear in the former and 3 in the latter. Even in the crushed condition, these shells can be distinguished from *Rhynchonella ? emacerata* (Hall) by the presence of 4, not 6, plications on the fold, and by the absence of smaller intercalated plications between them.

Width 15 mm., length 13 mm.

Horizon and Locality. At Arisaig this species is very rare in zone b and common in zone c of the McAdam formation. It is also found in the shale and lower part of the limestone at Lockport, N.Y., and in the lower part of the lower Rochester shale at Niagara.

Types. Peabody Museum of Yale University; plesiotypes, Cat. Nos. 438c to 438d; plesioplastotypes, Cat. Nos. 438 to 438b.

Genus, *Eatonioides* McLearn

1918. *Eatonioides* McLearn, Am. Jour. Sci., vol. 45, p. 137.

Sparingly plicate, anteriorly deeply sinuate rhynchonellids, having a highly convex dorsal valve and a shallow, marginally deflected ventral valve; median dorsal fold, and ventral sinus. Ventral muscle area broad, rounded, flabellate, and excavated. Hinge-plate and crural cavity as in *Camarotoechia* except that the divisions of the hinge-plate are slightly thickened; short, stout, dorsal, median septum. In later Silurian time the surface is lamellose. Genotype, *Eatonioides lamellornatus* McLearn.

Some time in the early Silurian, the *Eatonia* group arose out of *Camarotoechia* in a plicate form and in the Atlantic realm. The main line of evolution is probably not recorded at Arisaig, however, and it cannot be said that the Arisaig sea contributed the later genera to the Helderberg and Oriskany faunas. In early McAdam time, however, a form very near the generalized stock was in the Arisaig sea, and again in Moydart time a specialized form, with lamellose surface, terminal in development, also existed there. The conclusion to be drawn is that the progenitors of the Devonian genera are to be sought in the northern Atlantic realm and in seaways open to the Arisaig.

The shells of the Devonian subgenus *Pareatonia* McLearn[1] inherit from Silurian *Eatonioides* the shell form, the broad, rounded, flabellate, and excavated ventral muscle area, and the short, stout, dorsal, median septum; they acquire radiating striæ and a "cardinal process" by great elevation of each division of the hinge-plate. The shells of Devonian *Eatonia* Hall lose the radiating folds, acquire radiating striæ, and form an elongate ventral muscle area.

Among the Devonian *Pareatonia* species are: *Eatonia* (*Pareatonia*) *eminens* (Hall), *E.* (*Pareatonia*) *medialis* (Vanuxem), *E.* (*Pareatonia*) *sinuata* (Hall), *E.* (*Pareatonia*) *hartleyi* Schuchert, and *E.* (*Pareatonia*) *whitfieldi* (Hall). *Eatonia* includes *E. singularis* (Vanuxem), *E. peculiaris* (Conrad), *E. coulteri* Miller and Gurley, *E. pumila* Hall, *E. fissicosta* Dunbar, and *E. tennesseensis* Dunbar. The last two are intermediate. *E. tennesseensis* has the elongate ventral muscle area of the genus.

Eatonioides westoni n.sp.

Plate VII, figures 16, 17, 21; Plate XXX, figures 4, 7

This species has two plications on the fold and one in the sinus; total plications 18 to 20. Inequivalve, the dorsal valve being very convex and the ventral the more shallow. The sinus is deep. Compared with *Eatonioides lamellornatus* McLearn, this species has fewer plications on the fold, but a greater number of total plications, and the lateral margins of the ventral valve are not deflected. The shape and outline, however, are much like those of the later species.

Size of the largest specimen (possibly somewhat distorted), width 16 mm., length 12 mm.

Size of the smallest specimen, width 14 mm., length 13 mm.

Horizon and Locality. Only three specimens are known, from the base of zone b of the McAdam formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holoplastotype, Cat. No. 439; paratype, Cat. No. 439a.

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[1] Am. Jour. Sci., vol. 45, p. 137.

Eatonioides lamellornatus McLearn

(*lamella*, scale; *ornatus*, adorned)

Plate VII, figures 22-31; Plate VIII, figures 34, 35; Plate XXX, figure 1

1918. *Eatonioides lamellornatus* McLearn, Am. Jour. Sci., 45, p. 138.

The form closely resembles that of *Eatonia* (*Pareatonia*) *medialis* (Vanuxem): outline transversely oval to subquadrate; broad and deep mesial ventral sinus and dorsal fold; inequivalve, dorsal valve much the larger; compared with the Devonian species even more inequivalve. Covered with about 12 strong plications, 4 of which are in the dorsal fold and 3 are in the ventral sinus. The radiating striæ of the Devonian species are absent and in their place are concentric lamellæ.

Width 25 mm., length 22 mm.

Horizon and Locality. Common in zone a of the Moydart formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 5435; paraplastotypes, Cat. Nos. 5434a, 5434b: Peabody Museum of Yale University; paratype, Cat. No. 440.

Genus, *Wilsonia* Kayser

1871. *Wilsonia* Kayser, Zeits. d.d. geol. Gesell., 23, p. 502.
1893. *Wilsonia* Hall and Clarke, Pal. N.Y., 8, pt. 2, p. 195.
1913. *Wilsonia* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 398.

Subcuboidal to subpentahedral shells, having low plications, which are anteriorly divided by fine median sulci or lines; broad, ventral muscle scar; teeth and dental plates variably cemented to lateral walls. Dorsal interior as in *Camarotoechia*. Genotype, *Terebratula wilsoni* Sowerby.

Wilsonia wilsoni var. *saffordi* (Hall)

Plate VIII, figures 25 to 29

1860. *Rhynchonella saffordi* Hall, Can. Nat. Geol., 5, p. 146.
1868. *Rhynchonella saffordi* Dawson, Acadian Geol., 2d. ed., p. 598.
1892. *Rhynchonella saffordi* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 188.
1897. *Wilsonia saffordi* Schuchert, Bull. U.S. Geol. Surv., 87, p. 462.
1915. *Wilsonia saffordi* Bassler, Bull. U.S. Nat. Mus., 92, p. 1331.

Original Description. "Shell varying in form from ovoid to globose. Full-grown specimens usually wider than long, and sometimes becoming extremely ventricose, so that the diameter across the two valves much exceeds the length. Ventral valve depressed convex, with the beak minute, closely incurved; dorsal valve very ventricose, most prominent toward the front. Cardinal slope a little depressed, sides rounded, and the front in direct line flattened but not depressed. Surface finely plicated, plications little elevated, rounded, or scarcely subangular, about five or six depressed in the flattened sinus of the ventral valve and a corresponding number raised on the flattened mesial elevation, which rises abruptly though usually only slightly above the lateral parts of the shell. From ten to fourteen plications mark the surface on each side of the mesial fold and sinus. Plications in front marked by a sharp groove along the centre, and those of each valve deeply interlocking.

"This species resembles the *R. nucleolata* of the Lower Helderberg rocks of New York, and in some specimens it approaches to *R. ventricosa*, but is always much more finely plicated than either. It closely resembles the *R. Wilsoni* of Europe in its general form, but the plications are more rounded and somewhat coarser, and while in that species the sinus causes no depression in the ventral valve below the general surface of the shell, in ours there is an abrupt depression as well as a slightly abrupt elevation on the dorsal valve, while there is no similar feature in the *R. Wilsoni*."

"The Nova Scotia specimens are in all respects identical with those from Tennessee."

Wilsonia wilsoni (Sowerby) and its North American representatives, always identified as W. *saffordi* (Hall), exhibit a great deal of variation. In certain areas, however, some particular variation or range of variation predominates, giving a local impress. The Arisaig, Kentucky, and Tennessee varieties differ from each other and from the European *W. wilsoni* in this manner. The variations of the Arisaig specimens overlap those of the European species.

On the average, the Arisaig specimens have fewer plications than *W. wilsoni* and are intermediate between the latter and *W. wilsoni* var. *davidsoni* (McCoy). More than half the specimens studied have 10 plications per 10 mm. on the anterior border. The remainder have from 8 per 10 mm. to 12 per 10 mm. Fifteen out of twenty-five Arisaig specimens have an abruptly marginated fold and sinus, moderately well defined. In *W. wilsoni* a fold and sinus are present in some specimens, but not so well defined. The size is about half of that of the average of *W. wilsoni;* width 12-17 mm., length 11-17 mm. The total depth varies from two-thirds to the equal of the width. The above comparisons show that in no character do the Arisaig specimens differ constantly from *W. wilsoni*. Certain degrees of variation, however, are peculiar to the locality and on these the variety *saffordi* is based.

The variation in the Kentucky specimens (Louisville limestone) is toward much coarser plication.

The Tennessee (Brownsport) variety is more distinct; the plications are less flattened, except in the sinus, and the fold and sinus are more prominent.

Horizon and Locality. Common at one horizon near the base of zone a of the Moydart formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; plesiotype, Cat. No. 443.

Wilsonia wilsoni mut. *stonehousensis* n. mut.

Plate VIII, figure 32

Compared with *Wilsonia wilsoni* var. *saffordi* (Hall), this mutation is considerably larger, the anterior surface is not so abruptly deflected, the fold and sinus are not well defined, and the anterior plications are very coarse.

Width 20 mm., length 21 mm.; depth of dorsal valve 9 mm., of ventral valve, 7 mm.

Horizon and Locality. Rare in a boulder on the shore below exposures of zone c of the Stonehouse formation, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5436.

Genus, *Plagiorhyncha* McLearn

1918. *Plagiorhyncha* McLearn, Am. Jour. Sci., vol. 45, p. 138.

Dorsal interior as in *Camarotoechia*, i.e., having a median septum, divided hinge-plate, crural cavity, and crura. The teeth, however, are not supported by a dental plate produced forward from the walls of the rostral cavity, but are borne on a plate arising from the lateral walls of the ventral valve. Outline of shells characteristically subcircular. Earlier species are plicated biconvex, from which arise independently almost smooth and also striated species, both having shallow and marginally deflected ventral valves. Genotype, *Rhynchonella glassi* Davidson (=*Atrypa depressa* Sowerby).

The species here referred to *Plagiorhyncha* have long perplexed palæontologists; they have been placed under *Hypothyris, Atrypa, Athyris, Anabaia, Rhynchonella,* and *Camarotoechia.* The rhynchonellid character, based on the form and position of the crura, was demonstrated by Davidson from specimens prepared by Glass. The presence of a crural cavity and the absence of spiralia led Twenhofel to place the plicated species under *Camarotoechia;* it cannot be left there on account of the structure of the dental apparatus. *Anabaia* differs from this genus by having a cardinal process and, supposedly, a calcareous spiral skeleton.

The following species are placed in the new genus: *Rhynchonella glassi* Davidson (=*Atrypa depressa* Sowerby), *Plagiorhyncha plastica* n.sp., and *Camarotoechia decemplicata* (Sowerby).

Plagiorhyncha decemplicata (Sowerby)

Plate VIII, figures 1 to 4

1839. *Terebratula decemplicata* Sowerby, in Murchison's Sil. Syst., p. 641, Pl. 21, fig. 17.
1848. *Hypothyris decemplicata* Phillips and Salter, Mem. Geol. Surv., Great Britain, 2, p. 280.
1859. *Rhynchonella decemplicata* Salter, Siluria, 3d. ed., p. 544, Pl. 9., fig. 15.
1866. *Rhynchonella eva* Billings, Cat. Sil. Foss. Anticosti, p. 44.
1871. *Rhynchonella decemplicata* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 177, Pl. 23, figs. 20-24.
1884. *Rhynchonella decemplicata* Davidson, Ibid., Suppl., 151, Pl. 11, fig. 27.
1890. *Rhynchonella decemplicata* Foerste, Proc. Boston Soc. Nat. Hist., 24, p. 320, Pl. 6, figs. 23, 24.
1900. *Anabaia anticostiana* Clarke, "The Palæozoic Faunas of Pará", p. 15, Pl. 1, figs. 26-28.
1914. *Camarotoechia decemplicata* Twenhofel, Vict. Mem. Mus., Bull. 3, p. 28.

Original Description of Sowerby. "Nearly globose, plaited, plaits 10, angular, two of them greatly elevated in the front; beaks small, pointed."

Davidson's Description of 1871 (pars.). "This species is easily recognizable on account of its wide biplicated fold and sinus, and small simple lateral ribs; but it is a mistake to suppose that, as its name would imply, not more than ten ribs ornament the surface of each valve, for I have counted from ten to fifteen in different examples."

This species has a peculiar, somewhat rounded, semirectangular outline, being very broad near the hinge-line and near the anterior margin. In the Arisaig specimens the plications on either side of the dorsal fold vary from 3 to 6 and are commonly less angular than in the Anticosti and English specimens. The ventral valve shows a slight tendency to become deflected or flattened on the margins. This occurs rarely in other than Arisaig shells. Compared with *Camarotoechia bimesiornata* n.sp., it is not transverse, is somewhat more rounded, and differs in the dental apparatus. Otherwise the two species are, on the exterior, much alike.

In England this species is found in the Upper Llandovery. Foerste has reported it from Cumberland Gap, Tennessee. At Anticosti it has been recognized by Twenhofel[1] where it was previously identified as *Rhynchonella eva* Billings and *Anabaia anticostiana* Clarke. Kiaer has found it in etage 6c of the Christiania section.

Width 8 mm., length 7-8 mm.

Horizon and Locality. Common in zones b and d of the Ross Brook formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5437-5440.

Plagiorhyncha plastica n.sp.
(*plasticus*, formative)
Plate VIII, figures 5 to 7, 33; Plate XXVIII, figure 11

Compared with *Plagiorhyncha decemplicata* (Sowerby) the size is larger and the ventral valve is more shallow. The lateral margins are flattened and deflected ventrally. The surface is either striate or both striate and plicate. The plications, where present, are a little smaller and more numerous than in *P. decemplicata* and are strongest in the posterior region. Anteriorly, they die out and are replaced by angular striæ. In many specimens both are unequally developed, resulting in a heterogeneous combination of plications and striations, the former breaking down irregularly over the surface and sprawling out in fine and coarse angular striations.

Horizon and Locality. Restricted to and common in zone c, Ross Brook formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 441a; paratypes, Cat. Nos. 441, 441b.

Plagiorhyncha plastica var. *media* n.var.
(*medius*, middle)
Plate VIII, figures 8, 9.

This variety is intermediate between *Plagiorhyncha plastica* n.sp., and *P. decemplicata* (Sowerby), but is in all specimens larger than the latter and has the characteristic form of *P. plastica* and *P. glassi* (Davidson). There are four plications on the fold and at least eight small ones on either side, corresponding to a bifurcation of each of those of *P. decemplicata.* The resemblance to *P. plastica* is through the more plicate forms of the latter, to which the plications correspond in number, especially those on the fold. The variety *media*, the predominantly plicate specimens of *P. plastica*, and the predominantly striate specimens of *P. plastica* are three stages in the derivation of a striate species out of *P. decemplicata*. Nearly all connecting forms are present.

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[1] Vict. Mem. Mus., Bull. 3, p. 29.

Width 12 mm., length 9 mm.

Horizon and Locality. Rare and restricted to zone c, Ross Brook formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 441c; paratype, Cat. No. 441d.

Plagiorhyncha glassi (Davidson)

Plate VIII, figures 10 to 17, 36; Plate XXIX, figure 2

1839. *Atrypa depressa* Sowerby, Murchison's Sil. Syst., p. 629, Pl. 13, fig. 6.

1871. *Athyris* (*?*) *depressa* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 123, Pl. 12, figs. 11-15; Pl. 13, fig. 6 (*see* for synonomy).

1884. *Rhynchonella glassi* Davidson, Ibid. Suppl., p. 155, Pl. 10, figs. 22, 22a.

Davidson's Description of 1871. "Transversely obovate, widest anteriorly; front nearly straight; dorsal valve varying in degree of convexity, but deeper than the opposite valve; mesial fold of moderate width, very slightly raised above the general convexity of the valve, and divided by a central longitudinal sulcus; the lateral portions of the valve sloping rapidly to the margin, which in front is slightly incurved. On each of the lateral portions of the valve there exist two or three obscurely marked ribs or undulations. Ventral valve moderately convex, with a wide shallow sinus, extending from the extremity of the beak to the front, along the middle of which runs a small longitudinal rib, two or three rounded ribs being also present on the lateral portions of this valve. Beak pointed, small, and incurved, with a narrow triangular opening under its extremity, but rarely visible, owing to the incurvation of the beak. Lateral portions of the valve depressed towards the margin, which is sharp and slightly sigmoid. Surface of valves marked with concentric lines of growth. Shell-structure fibrous, not punctured."

This shell, like *Plagiorhyncha plastica* n.sp., is closely related to *P. decemplicata* Sowerby and derived therefrom. It is a longer ranging species. It resembles *P. plastica* in both form and size. It is larger than *P. decemplicata* and the lateral margins of the ventral valve are concave, i.e., deflected ventrally. In the posterior region of *P. glassi* the outline of *P. decemplicata* can be traced by the growth lines; there the plications are distinct and correspond to those of *P. decemplicata;* anteriorly, i.e., in later stages of growth, the plications on either side of the fold become obsolescent and the surface is almost smooth; the plications of the fold remain distinct as in *P. decemplicata.* There are no radiating striæ as in *P. plastica.* As the plications do not divide, it has evidently not gone through any of the *plastica* stages and is a separate development out of *P. decemplicata.* It appears rather suddenly in the Arisaig section without gradational forms, although not until its progenitor had existed there for some time. The same species is found by Kiaer in the Llandovery of the Christiania section, but is not known in the English faunas until the Wenlock.

Width 11 mm., length 11 mm.

Horizon and Locality. Very common in zone d and very rare in zone e of the Ross Brook formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesioplastotypes, Cat. Nos. 5441a, 5441b, 5442: Peabody Museum of Yale University; plesiotypes, Cat. Nos. 441e, 441f.

Superfamily, Spiriferacea Waagen
Family, ATRYPIDAE Gill
Subfamily, **Atrypinae** Waagen
Genus, *Atrypa* Dalman

1828. *Atrypa* Dalman, Kongl. Svenska Vet.-Akad. Handl., p. 102.
1893. *Atrypa* Hall and Clarke, Pal. N.Y., 8, pt. 2, p. 163, Pl. 54.
1913. *Atrypa* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 409.

Plicate and lamellose or spinose Atrypidae, having a highly convex dorsal and a more shallow ventral valve. The crura arise from the inner lobes of the hinge-plate; spirals introverted, the discrete jugum situated posteriorly. Ventral muscle scar large and flabellate. Genotype, *Anomia reticularis* Linnaeus.

Atrypa reticularis (Linnaeus)
Plate VIII, figures 37, 38

1767. *Anomia reticularis* Linnaeus, Syst. Nat., 12th ed., 1, p. 1132.
1852. *Atrypa reticularis* Hall, Pal. N.Y., 2, p. 72, Pl. 23, fig. 8; p. 270, Pl. 55, fig. 5.
1871. *Atrypa reticularis* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 129, Pl. 14, figs. 1-22 (*see* for European synonymy to 1871).
1892. *Atrypa reticularis* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 188.
1897. *Atrypa reticularis* Schuchert, Bull. U.S. Geol. Surv., 87, p. 154.
1915. *Atrypa reticularis* Bassler, Bull. U.S. Nat. Mus., 92, p. 93 (*see* for American synonymy).

Hall's Description (pars.). "Shell subrotund, more or less compressed, subtruncated above or on the hinge-line; valves more or less equal, the beak of the dorsal valve extending beyond the ventral valve, and the latter being deeper and more convex in older specimens; surface marked by dichotomous rounded striæ, which are crossed by concentric elevated lamellæ, giving a reticulated or decussated character to the surface."

Although this is a very variable species, the nature of, and the range in variation and mutation of, some of its characters are fairly constant. In all the specimens from this locality the ventral valve is very shallow and the dorsal very convex. This is true of the species in general, but is to be contrasted with the more nearly equivalve forms from the Niagaran at Waldron, Indiana, and at Hillsboro, Ohio. In the Ross Brook the specimens are small and poorly preserved. The McAdam specimens are larger, about 25 mm. wide, and 22 mm. long, and somewhat transverse, not elongate. Compared with these the Stonehouse shells are much larger, the outline commonly more elongate, and the striæ much coarser. The size of these elongate specimens averages about: width 25 mm., length 30 mm.

The tendency to become elongate throughout the Silurian is not confined to the Arisaig stock, but to some extent, at least, is general. The evolution toward more coarsely striated shells is not so general but is more typical of this locality.

Horizon and Locality. Very rare in zones b, c, and e of the Ross Brook, rare in zone b of the McAdam, and common in zone a and rare in zone b of the Stonehouse formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotype, Cat. No. 5443: Peabody Museum of Yale University; plesiotype, Cat. No. 444.

Family, SPIRIFERIDAE King
Subfamily, **Spiriferinae** Schuchert
Genus, *Delthyris* Dalman

1828. *Delthyris* Dalman, Kongl. Svenska Vet.-Akad. Handl. for 1827, pp. 93, 99.
1893. *Delthyris* Hall and Clark, Pal. N.Y., 8, pt. 2, pp. 9, 16, 19.
1913. *Delthyris* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 411.
1914. *Delthyris* Weller, Mon. Geol. Surv. Ill., 1, p. 300.
1916. *Delthyris* H. S. Williams, Proc. U.S. Nat. Mus., 51, pp. 73-76 (general reference).

Coarsely plicate Spirifers; surface lamellose; dental lamellæ present and in most specimens prominent. Ventral median septum variably developed. Genotype, *Delthyris elevata* Dalman.

The Arisaig species all belong to the section *Fimbriati-unicispinei*, or the *Spirifer crispus*-type, of Hall and Clarke. They represent an important line of Atlantic realm succession of species in which the size increases, additional plications are formed, the dorsal fold becomes divided by a median sulcus, the ventral septum becomes prominently developed, and the beak folds back, exposing the greatly heightened and flattened cardinal area. The *Spirifer sulcatus-perlamellosus* group is another stock, is not represented at Arisaig, and should receive a new generic name.

Delthyris crispa (Hisinger)
Plate VIII, figure 18

1826. *Terebratula crispa* Hisinger, K. Svenska Vet.-Akad. Handl., tab. 7, fig. 4.
1852. *Spirifer crispus* Hall, Pal. N.Y., 2, p. 262, Pl. 54, fig. 3; p. 328, Pl. 74, fig. 9.
1871. *Spirifera crispa* Davidson, Mon. Brit. Sil. Brach. Pal. Soc., p. 97, Pl. 10, figs. 13-15 (*see* for synonymy).
1892. *Spirifer crispus?* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 188.
1897. *Spirifer crispus* Schuchert, Bull. U.S. Geol. Surv., 87, p. 386 (*see* for American synonymy).
1915. *Spirifer* (*Delthyris*) *crispus* Bassler, Bull. U.S. Nat. Mus., 92, p. 1173 (*see* for synonymy).

Davidson's Description. "Shell small, transversely oval; valves moderately convex; hinge-line a little shorter than the width of the shell; cardinal angles rounded. Dorsal valve rather less deep than the ventral, with three, five, or seven ribs, of which the central one is the largest, although in elevation exceeding but little those that are next to it on either side. Ventral valve rather more convex than the opposite one, plications two or three on either side of sinus. The whole surface of both valves covered by numerous, sharp, regular, concentric, slightly projecting lines of growth; beak moderately incurved; area triangular, of small dimensions; fissure partly margined by a deltidium.''

At Arisaig this species is rather small, and the outline somewhat transverse. There are two plications and the beginning of a third on either side of the broad, dorsal, median plication, which is rarely divided by a sulcus. The beak is incurved.

Width 7-10 mm.; length 5-6 mm.

Horizon and Locality. Common in zone c of the McAdam formation, coast section, Arisaig, N.S. Common in the Niagaran of North America and in the Upper Llandovery and upward in the British sections. Found in etage 8c to 9d (Kiaer) in the Christiania section.

Type. Peabody Museum of Yale University; plesiotype, Cat. No. 442.

Delthyris crispa mut. *moydartensis* n. mut.

Plate VIII, figures 19 to 24

Delthyris crispa (Hisinger) is followed in the Moydart formation by a slightly larger and more plicate mutation. This mutation has three to five plications on either side of the broad median plication or fold of the dorsal valve. The fold is rarely divided. The outline is transverse. The beak is incurved and the cardinal area is as in *Delthyris crispa* (Hisinger). Etching of one or two specimens demonstrates the presence of a very low, incipient, ventral, median septum. Although only feebly developed, it is important in considering the relation of *D. crispa* to *D. rugaecosta* (Hall), and to *D. elevata* (Dalman).

Average width 11 mm., average length 7 mm.

Horizon and Locality. Rare in zone a of the Moydart formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 442a; paratype, Cat. No. 442b.

Delthyris rugaecosta (Hall)

Plate VIII, figure 31; Plate IX, figures 1 to 3

1860. *Spirifera rugaecosta* Hall, Can. Nat. Geol., 5, p. 145.
1868. *Spirifera rugaecosta* Dawson, Acadian Geol., 2d. ed., p. 596.
1892. *Spirifer rugaecostus* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 188.
1897. *Delthyris* (?) *rugicosta* Schuchert, Bull. U.S. Geol. Surv., 87, p. 208.
1915. *Spirifer* (*Delthyris?*) *rugicostus* Bassler, Bull. U.S. Nat. Mus., 92, p. 1177.

Original Description. "Shell somewhat semi-elliptical; dorsal valve very convex, with the mesial fold depressed along the centre; ventral valve with a wide, deep, mesial sinus; plications six or seven on each side of the mesial fold and sinus, strong, and much elevated, subangular, crossed by numerous strongly elevated, lamellose, imbricating concentric striæ.

"In many respects this species resembles the *S. perlamellosa* of the Lower Helderberg group in New York, but the mesial elevation of this species is flattened or depressed, a character never observed in New York specimens."

Delthyris elevata (Dalman) is a closely related species, whereas *D. perlamellosa* (Hall) belongs to another group of *Delthyris* in which the relatively coarse lamellæ are crossed by very fine radiating striæ. In the *elevata* group, the more closely set lamellæ are fringed on the anterior side by short, incipient, spine-like processes, as Hall and Clarke have shown. *D. rugaecosta* has this structure. It has also a well-developed median septum in the ventral valve. *D. crispa* mut. *moydartensis* n. mut., exhibits only a small, low, thin, ventral, median septum.

D. rugaecosta has a number of characters in common with *D. elevata*, characters in which both differ from *D. crispa*. A high ventral median septum is present in both, and the dorsal fold is divided by a median sulcus, which is more marked in the Arisaig species. The latter in some specimens has a small plication in the sinus. The cardinal area of the Arisaig species is much higher than in *D. crispa*. It is also flatter and directed ventrally, not rising posteriorly above the hinge-line to any extent. The beak is less incurved. *D. elevata* is similar, but the high cardinal area in some specimens curves posteriorly so that the beak rises somewhat above the cardinal margin. The Arisaig species is much larger than *D. elevata*, width 27-36 mm., length 15-20 mm.

Spirifer bijugosus McCoy has a median sulcus on the fold, but plications on either side are more numerous and the cardinal area is narrow.

The fold of *Spirifer* commonly does not become plicated until later in the Palæozoic, although in the later Silurian of the Atlantic province it is divided by a single median sulcus.

Horizon and Locality. Very common, zones b to d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S. According to Davidson, *S. elevatus* ranges from Upper Llandovery to Upper Ludlow, but in the Christiania section Kiaer finds it only in the Ludlow.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 3095, 3095a, 3095c.

Delthyris rugaecosta mut. *prima* n. mut.

(*primus*, first)

Plate VIII, figure 30

The specimens of *Delthyris rugaecosta* (Hall) are smaller in the lower Stonehouse than in the upper. Other characters are the same, except that at the base of the formation there are, on the average, only 3 or 4 plications on either side of the dorsal fold instead of the normal 5 to 7. The majority of the specific characters appear in the specimens at the base of the formation, however. The earliest have the high, flat, cardinal area, the beak little incurved, and the ventral median septum well developed. *Spirifer cobscooki* H. S. Williams[1] lacks the median septum in the ventral valve. *Spirifer* (*?Delthyris*) *trescotti* H. S. Williams[2] has the median septum in the ventral valve, but the cardinal area is not so high and flat. This species is also smaller.

Width 19-26 mm., length 11-17 mm.

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[1] Proc. U.S. Nat. Mus., 51, 1916, p. 76.

[2] Proc. U.S. Nat. Mus., 51, 1916, p. 73.

Horizon and Locality. Very common in zone a of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 442c.

Delthyris rugaecosta var. *subsulcata* (Hall)

1860. *Spirifer subsulcatus* Hall, Can. Nat. Geol., 5, p. 145.
1868. *Spirifera subsulcatus* Dawson, Acadian Geol., 2d. ed., p. 597.
1892. *Spirifer subsulcatus* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 188.
1897. *Spirifer subsulcatus* Schuchert, Bull. U.S. Geol. Surv., 87, p. 406.
1915. *Spirifer* (*Delthyris*) *subsulcatus* Bassler, Bull. U.S. Nat. Mus., 92, p. 1178.

Original Description. "Shell semielliptical, hinge-line equalling or greater than the length of the shell below; plications five or six on each side of the mesial fold; mesial fold somewhat flattened or very slightly rounded on the summit; plications rounded; surface concentrically lamellose."

This is a variety of *Delthyris rugaecosta* (Hall) and agrees with it in all characters except that the dorsal fold is flattened or rounded. All gradations exist between rounded or flattened folds and those having a definite sulcus. It is found at all horizons in the Stonehouse with the normal species.

Horizon and Locality. Common in zones b to d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Type. Not figured. Lectotype in American Museum of Natural History, New York.

Genus, *Eospirifer* Schuchert

1913. *Eospirifer* Schuchert, Zittel-Eastman Textb. Pal., 2d ed., p. 411.

Smooth, radially undulate or plicate Spirifers having in addition radiating striæ. Dental lamellæ present. Genotype, *Spirifer radiatus* Sowerby.

Eospirifer stonehousensis n.sp.

Plate IX, figure 8

Eospirifer, a widely spread genus of Silurian time, is represented at Arisaig by a single specimen of a ventral valve. One side is well preserved and has ten plications, decreasing in size away from the sinus. In number of plications it is intermediate between *Eospirifer niagarensis* (Conrad)[1] and *E. asperatus* (Ringueberg).[2] In North European faunas it is nearest to the more strongly plicate forms of *E. plicatellus* (Linnaeus)[3]; in this respect, therefore, its characters are Silurian. In size, however, it is greater than any of the Silurian members of the genus and comparable with *E. macropleura* (Conrad).[4] It has fewer plications than the latter.

Width 55 mm., length 35 mm.

Horizon and Locality. A single specimen picked up on the shore at Arisaig, and evidently from the upper zones of the Stonehouse formation.

Type. Peabody Museum of Yale University; holotype, Cat. No. 442d.

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[1] Jour. Acad. Nat. Sci. Phil., 8, 1842, p. 261.
[2] Bull. Buffalo Soc. Nat. Sci., 5, 1886, p. 16, Pl. 2, fig. 5.
[3] Mon. Brit. Sil. Brach., Pal. Soc., p. 84, Pl. 9, figs. 9-12.
[4] Pal. N.Y., 3, 1859, p. 202, Pl. 27, fig. 1; Pl. 28, fig. 8.

Family, RHYNCHOSPIRIDAE Hall and Clarke

Genus, *Rhynchospira* Hall

1859. *Rhynchospira* Hall, 12th Rept. N.Y. State Cab. Nat. Hist., p. 29.
1893. *Rhynchospira* Hall and Clarke, Pal. N.Y., 8, pt. 2, p. 108, Fig. 101.
1913. *Rhynchospira* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 414.

Plicate, commonly elongate, shells; hinge-line curved. Hinge-plate is divided, and the two halves are closely approximated and highly elevated. Median septum short and poorly developed.

The species referred below to this genus are proportionately shorter than the Devonian representatives of the genus. They lack the straight hinge-line of *Trematospira.* The divisions of the hinge-plate are closely approximated, not widely diverging as in *Homoeospira.* Genotype, *Waldheimia formosa* Hall.

Rhynchospira salteri var. *acadiae* (Hall)

Plate X, figures 1 to 7

1860. *Trematospira acadiae* Hall, Can. Nat. Geol., 5, p. 146, fig. 4.
1878. *Trematospira acadiae* Dawson, Acadian Geol., 3d. ed., p. 597, fig. 201.
1897. *Rhynchospira* (?) *acadiae* Schuchert, Bull. U.S. Geol. Surv., 87, p. 367.
1915. *Rhynchospira* (?) *acadiae* Bassler, Bull. U.S. Nat. Mus., 92, p. 1121.

Original Description. "Shell wider than long; beak of the ventral valve produced and incurved; mesial depression marked by a small fold on each side, which originates about one-third of the length below the beak and continues to the margin; sinus bounded on each side by a more strongly elevated plication, beyond which are six other plications on each side.

"Surface marked by fine concentric striæ.

"This shell is referred to the genus *Trematospira* from external characters alone, which are unlike *Rhynchonella* proper, and the shell is not a Spirifer."

The most common variation is that figured by Hall, i.e., with slightly transverse outline, 16 plications and fairly steep cardinal slopes. This is closest to *Rhynchospira salteri* var. *baylei* (Davidson)[1] from the Wenlock of England, but differs in the possession of two small mesial plications like *R. salteri* (Davidson)[2]. Many specimens are fairly globose. A variation away from the dominant expression is shown by other specimens which have more plications, up to 20. These approach *R. salteri* var. *bouchardi* (Davidson),[3] also from the Wenlock, but are in no specimens so multistriate and are not longer than wide. Another variation from the dominant form is shown by a few specimens that are very close to *R. salteri* (Davidson), of the Wenlock, but they are a little more transverse, and have very low cardinal slopes and fewer plications, 14-16.

Width 9-13 mm., length 7-11 mm.

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[1] Mon. Brit. Sil. Brach., Pal. Soc., p. 127, Pl. 12, figs. 23-25, 27.
[2] Mon. Brit. Sil. Brach., Pal. Soc., p. 125, Pl. 12, figs. 21, 22.
[3] Mon. Brit. Sil. Brach., Pal. Soc., p. 127, Pl. 12, figs. 26, 28, 30.

Horizon and Locality. Common in zone a of the Moydart formation and very rare in zone a of the Stonehouse, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; plesiotypes, Cat. Nos. 445, 445a, 445b.

Rhynchospira sinuata Hall
Plate X, figures 18, 19

1860. *Rhynchospira sinuata* Hall, Can. Nat. Geol., 5, p. 146.
1878. *Rhynchospira sinuata* Dawson, Acadian Geol., 3d. ed., p. 597.
1892. *Rhynchonella sinuata* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 188.
1897. *Rhynchospira* (?) *sinuata* Schuchert, Bull. U.S. Geol. Surv., 87, p. 368.
1915. *Rhynchospira* (?) *sinuata* Bassler, Bull. U.S. Nat. Mus., 92, p. 1122.

Original Description. "Shell ovoid, ventricose beak of the ventral valve incurved; a mesial sinus beginning a little below the beak; surface marked by about eight or nine simple scarcely subangular plications on each side the mesial sinus.

"Surface marked by concentric lines of growth.

"This species differs from the *R. formosa* of the Lower Helderberg rocks of New York in the plications being more slender, in the more defined sinus of the ventral valve, and the continuation of the two small folds in the sinus nearly to the beak."

Compared with *Rhynchospira salteri* var. *acadiae* (Hall), this species is larger, and has coarser and, on the average, more plications, 17 to 22. It has moderately steep, cardinal slopes, not low slopes like *R. salteri* (Davidson). It is not transverse, but the length equals or very slightly exceeds the width. A few ventral valves, which are much longer than wide, are apparently distorted, and there are no dorsal valves of such a form. These elongate valves resemble *R. formosa* Hall. Compared with that species, however, all the well-preserved Stonehouse specimens are larger, proportionately shorter, have coarser plications, and, as Hall notes, have a better defined ventral sinus.

Width 15-16 mm., length 15-17 mm.

Horizon and Locality. Rare in zone a and common in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; plesiotypes, Cat. Nos. 445e, 445f.

Family, MERISTELLIDAE Hall and Clarke
Subfamily, **Hindellinae** Schuchert
Genus, *Whitfieldella* Hall and Clarke

1893. *Whitfieldella* Hall and Clarke, Pal. N.Y., 8, pt. 2, p. 58.
1913. *Whitfieldella* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 415.

Smooth, ovate or elongate shells; beak small; a fold and sinus in most species. Jugum has a single curved process. Genotype, *Atrypa nitida* Hall.

In the species described below, the spiralia, jugum, etc., are not preserved, so that exact generic determination cannot be made.

Whitfieldella (?) *crassa* var. *beechhillensis* n. var.
Plate X, figures 14 to 16

Species Reference:

1839. *Atrypa crassa* Sowerby, Murchison's Sil. Syst., Pl. 21, fig. 1.
1871. *Meristella* (?) *crassa* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 117, Pl. 13, figs. 1-3.

The Arisaig variety is very closely related to the normal species. It has the typical ovate outline, the length is almost equal to the width, the lateral margins converge in a gentle curve to the narrow, gently rounded, anterior margin. The interior of the ventral valve has the thickened walls of the normal species, similar dental plates, and the deep pallial grooves. Both valves are tumid. The Beechhill variety, however, consistently has the maximum width, not at the middle of the shell, but posterior to it. A few specimens are longer than broad and one specimen is more than twice as long as wide; the majority have the length and breadth about equal, as in the normal species. In *Whitfieldella* (?) *angustifrons* (McCoy)[1], the length is considerably greater than the width and the lateral margins are more broadly rounded and not so convergent anteriorly. *W. oblata* (Hall)[2] is less tumid, in most specimens is smaller, and has a well-developed fold and sinus. A large and more tumid form of *W. oblata*, in the Cabot Head Shale member of the Cataract, at Stony Creek, Ontario, is near *W.* (?) *crassa.*

Specimens from Bear brook, Pictou county, are about 20 mm. wide and 20 mm. long; from Doctor brook, Arisaig, N.S., 14 by 14 mm.; and from Cameron brook, 12 mm. wide and 14 mm. long. A peculiar elongate specimen from Doctor brook is 9 mm. wide and 15 mm. long.

W. (?) *crassa,* according to Davidson, is common in the Lower Llandovery of England and rare in the Upper Llandovery of England. In Norway, it is found in etage 5b (Kiaer). *W. oblata* is found in the Medina of New York and the Cataract of Ontario, etc.

Horizon and Locality. A few specimens are present in the Beechhill formation at Beechhill cove and a number of good ones have been collected from Doctor brook, Arisaig, horizon not known; in Pictou county it has been found on Cameron brook, Sutherland river, and near Bear brook.

Types. Victoria Memorial Museum; holoplastotype, Cat. No. 5444a; paraplastotypes, Cat. Nos. 5445a, 5446a.

Whitfieldella (?) *northumberlandensis* n.sp.
Plate X, figure 8

In form and size, this species resembles *Whitfieldella* (?) *laeviuscula* (Sowerby)[3] from the Wenlock of England. It has a similar elongate-ovate form, but is more convex and has a well-developed ventral sinus extending from the anterior margin about midway to the beak. Compared with *W. nitida* (Hall)[4] it is much smaller, more globose, and elongate. It is much smaller than *W. laevis* (Vanuxem)[5] and has a smoother surface. The dorsal valve and interior characters of the ventral valve are not known.

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[1] Mon. Brit. Sil. Brach., Pal. Soc., p. 111, Pl. 10, figs. 21-27.
[2] Pal. N.Y., vol. 2, 1852, p. 9, Pl. 4. figs. 4, 5.
[3] Murchison's Sil. Syst., 1839, p. 631, Pl. 13, fig. 14.
[4] Pal. N.Y., vol. 2, 1852, p. 268, Pl. 55, fig. 1.
[5] Pal. N.Y., vol. 3, 1859, p. 247, Pl. 39, figs. 3, 4.

Width 8 mm., length 11 mm.

Horizon and Locality. Very rare in zone a of the Moydart and very rare in zone a of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 445c.

Whitfieldella ? cf. *angustifrons* (McCoy)

Plate X, figures 22 to 24

Compare with:

1851. *Hemithyris angustifrons* McCoy, Ann. Mag. Nat. Hist., ser. 2, 8, p. 391.
1871. *Meristella angustifrons* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 111, Pl. 10, figs. 21-27.

In North European faunas the nearest approach to this Arisaig species is *Whitfieldella*? *angustifrons* (McCoy), which it resembles in the elongate elliptical outline, prominent beak, and development of the dental lamellæ. *Hindella umbonata* (Billings)[1] is also elongate elliptical, but has a fuller beak than *W.*? *angustifrons.* Another species of the same type is *H.* (?) *ambigua* Savage.[2] *W. cylindrica* (Hall),[3] although an elongate species, differs from the above shells by having abruptly inflected lateral margins. *W. oblata* (Hall) is a little more depressed and is proportionately wider. The lateral margins are not broadly rounded, but slope from near the middle of the shell abruptly both to the beak and to the anterior margin.

W. ? *angustifrons* is found in the Lower Llandovery of England and Scotland, and in etage 5b of the Christiania region. *H. umbonata* occurs in the Becsie and Gun River formations at Anticosti, and *H.* (?) *ambigua* comes from the Edgewood formation of Pike county, Illinois.

Width 15 mm., length 19 mm.

Horizon and Locality. A single specimen, the mould of the interior of both valves, was collected by T. C. Weston from Cameron brook, Pictou county, N.S., and labelled Arisaig A, the equivalent of the Beechhill there.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 5447.

Subfamily, **Meristellinae** Waagen

Genus, *Meristina* Hall

1867. *Meristina* Hall, 20th Rept. N.Y. State Cab. Nat. Hist., p. 157.
1893. *Meristina* Hall and Clarke, Pal. N.Y., 8, pt. 2, p. 65.
1913. *Meristina* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 415.

Large, biconvex, smooth shells. The jugal process is not simple, but bifurcates into two short branches. Genotype, *Meristella maria* Hall.

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[1] Geol. Surv., Can., Pal. Foss. 1, 1865, p. 144, fig. 121.
[2] Bull. Geol. Sur. Ill., 23, 1913, p. 89, Pl. 4, figs. 17-18.
[3] Pal. N.Y., vol. 2, 1852, p. 76, Pl. 24, fig. 2.

Meristina tumida (Dalman)?
Plate IX, figures 6, 7

1828. *Atrypa tumida* Dalman, Kongl. Svenska Vet.-Akad. Handl., 1828, p. 134, Pl. 5, fig.3.
1871. *Meristella tumida* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 109, Pl. 11, figs. 1-13.
1884. *Whitfieldella tumida* Davidson, Ibid., Suppl., p. 107, Pl. 5, figs. 5, 6; Pl. 6, figs. 1-9.
1893. *Meristina tumida* Hall and Clarke, Pal. N.Y., 8, pt. 2, p. 69.

Davidson's Description of 1871. "Shell variable in form, subcircular or rotundo-quadrate, usually a little wider than long; sometimes the width not exceeding the length. Valves almost equally deep and tumid. Dorsal valve uniformly convex to about the middle; the fold, which is confined to the anterior half, gradually rising from the lateral portions of the shell into a squarish elevation, divided along the middle by an angular depression or groove, which is continued to the umbone. The fold is also usually curved upwards, so that when viewed in profile the valve is convex from the umbone to about half its length, forming afterwards a concave curve to the extremity of the fold. Ventral valve convex, with a wide, square or obtuse sinus, commencing at about the middle of the valve, and extending to the front. It is also divided by a narrow groove, which, originating at the extremity of the beak, extends to the front. The lateral margins are rounded; front margin straight when the shell is young, but gradually rising, so as to form a rotundato-quadrate lobe towards the dorsal valve; beak small, and so much incurved as to almost touch the umbone of the opposite valve; no area or foramen visible. Surface of valves smooth, or marked only by fine concentric lines of growth, which are here and there stronger. . . . . . ."

The few Arisaig specimens are embedded in a boulder of calcareous sandstone. They are large and the ventral valve has a well-defined, though narrow, sinus. The surface has well-marked lines of growth. The dorsal fold is prominent in the anterior region of the valve. As there are only a few specimens, the Arisaig range of variation of this changeable shell is not known, and the local expression cannot be determined.

Width 40 mm., length 35 mm.
Width 26 mm., length 24 mm.

Horizon and Locality. Very rare in a boulder on the shore near exposures of the middle zones of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5448, 5449.

Meristina billingsi (Dawson)
Plate IX, figures 4, 5

1880. *Stricklandinia billingsiana* Dawson, Can. Nat., ser. 2, 9, p. 341.

Original Description. "This is a large shell, 6 centims. in breadth and 4 in length, with a pointed beak and the sides spreading at an angle of about 120 degrees to the broadly rounded lateral corners, which are united by a nearly straight margin. The surface presents unequal lines of growth, and in the middle of the dorsal valve is a low, flat ridge with a slight furrow in the centre. The ventral valve has a corresponding flat sulcus. This shell is closely allied to *L. Davidsoni* Billings, from the Upper Silurian of Gaspe, but it is much broader in form."

Compared with *Meristina tumida* (Dalman) and *M. maria* (Hall), this species is not only larger, but is more transverse and more depressed. The maximum width is a little anterior to the middle of the valve. The largest specimen in the Arisaig collections is 60 mm. wide and 43 mm. long.

Horizon and Locality. Common in zone a of the McAdam formation, Arisaig brook, Arisaig, N.S. Also found by Dawson on East river, Pictou county.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5450, 5451: McGill University coll.; lectotype, Cat. No. 1431a.

Family, COELOSPIRIDAE Hall and Clarke
Genus, *Coelospira* Hall

1863. *Coelospira* Hall, 16th Rept. N.Y. State Cab. Nat. Hist., p. 60.
1893. *Coelospira* Hall and Clarke, Pal. N.Y., 8, pt. 2, p. 134, figs. 122, 123
1913. *Coelospira* Schuchert, Zittel-Eastman Textb. Pal., 2d. ed., p. 417.

Planoconvex to slightly concavo-convex coelospirids; simple or bifurcating and somewhat numerous plications. Genotype, *Leptocoelia concava* Hall.

Coelospira hemispherica (Sowerby)
Plate X, figures 20, 21

1839. *Atrypa hemispherica* Sowerby, in Murchison's Sil. Syst., p. 639, Pl. 20, fig. 7.
1871. *Atrypa ? hemispherica* Davidson, Mon. Brit. Sil. Brach., Pal. Soc., p. 136, Pl. 13, figs. 23-30 (*see* for synonymy).
1892. *Leptocoelia hemispherica* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 188.
1897. *Anoplotheca hemispherica* Schuchert, Bull. U.S. Geol. Surv., 87, p. 145 (*see* for synonymy).
1915. *Coelospira hemispherica* Bassler, Bull. U.S. Nat. Mus., 92, p. 253.

Davidson's Description. "Shell small, suborbicular, usually wider than long; ventral valve subhemispherical, evenly convex; beak small, pointed, incurved, with a foramen beneath it. Dorsal valve very nearly flat and orbicular, slightly depressed along the middle; sides rounded; frontal margin a little deflected. Hinge-line very obtuse, nearly as long as the breadth of the shell; with rounded cardinal angles. Surface of each valve ornamented with from twelve to eighteen simple rounded or subangular ribs, with concave interspaces of about equal width; the valves are crossed at intervals by sharp, concentric, slightly raised, undulating lines."

The earliest appearance of this species at Arisaig is marked by considerable dwarfing. One lens is made up entirely of specimens only 3·5 mm. wide.

None of the specimens examined has a stronger mesial elevation than shown by *C. hemispherica* elsewhere. There is no justification for referring any of them to *Leptocoelia intermedia* Hall, described from this locality in 1860.

Width 6-10 mm., length 5-9 mm.

Horizon and Locality. Very common in zone b, rare in zone c, and very common in zones d and e of the Ross Brook formation, coast and Doctor Brook sections, Arisaig, N.S. Common in the Upper Llandovery of England, in etage 6a and 6b of the Christiania section, and the upper Gun River and Jupiter River of Anticosti, and in the Clinton of New York.

Types. Peabody Museum of Yale University; plesioplastotypes, Cat. Nos. 447, 447a.

Phylum, **MOLLUSCA**
Class, *PELECYPODA* Goldfuss
Family, SOLEMYACIDAE Dall
Genus, *Phthonia* Hall

1885. *Phthonia* Hall, Pal. N.Y., 5, pt. 1, Lam. 2, p. XLIV.
Genotype, *Cypricardites sectifrons* Conrad.

Phthonia ? semiradiata (Hall)
Plate XIII, figures 17, 18

1860. *Clidophorus semiradiatus* Hall, Can. Nat. Geol., 5, p. 150.
1868. *Clidophorus semiradiatus* Dawson, Acad. Geol., 2d. ed., p. 601.
1892. *Clidophorus semiradiatus* Ami, Trans. N.S. Inst. Sci., ser. 2, vol. 1, p. 189.
1915. *Clidophorus semiradiatus* Bassler, Bull. U.S. Nat. Mus., 92, p. 233.

Original Description. ''Shell somewhat oval-ovate, length about one-third greater than the height.

"Surface marked by fine concentric band-like striæ, and the posterior slope by flattened dichotomized radiating striæ, the two sets of striæ gradually dying out at their junction. A faint line anterior to the beak marks the place of the clavicle."

The outline varies somewhat, being more elongate in some specimens. There are no transverse teeth on the hinge-margin. Its generic position is problematical. In outward form it resembles some species of *Phthonia*, but the radiating striæ are confined to the posterior part of the shell.

Length 26 mm., height 12 mm.
Length 18 mm., height 10 mm.
Length 23 mm., height 12 mm.
Length 13 mm., height 8 mm.
Length 17 mm., height 13 mm.

Horizon and Locality. Very rare in zone b, common in zone c, and rare in zone d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5602, 5603.

Family, GRAMMYSIIDAE Fischer

Genus, *Grammysia* Verneuil

1847. *Grammysia* Verneuil, Bull. Geol. Soc. France (2) 4, p. 696.
1885. *Grammysia* Hall, Pal. N.Y., 5, pt. 1, Lam. 2, p. XXX.
1913. *Grammysia* Dall, Zittel-Eastman Textb. Pal., 2d. ed., p. 439.

Equivalve, inequilateral shells; prominent, incurved, subcentral to terminal beaks; well-marked lunule. Surface has concentric undulations, and one to several radiating grooves and folds. Hinge edentulous. Pallial line simple. A small species from Arisaig lacking the radiating grooves resembles the group *undulata*[1] of the Devonian. Genotype, *Grammysia hamiltonensis* Verneuil.

The Arisaig species are:

Cingulatae:
- *Grammysia unilira* n. sp.; in the McAdam
- *G. cingulata* mut. *intermedia* n. mut.; in the Moydart
- *G. triangulata* (Salter); in the Stonehouse
- *G. remota* Billings; in the Stonehouse

Obliquae:
- *G. obliqua* (McCoy); in the Stonehouse

Undulatae:
- *G. mcadamensis* n. sp.; in the McAdam

Obscure:
- *G.? speciosa* (Billings); probably in the Stonehouse

Grammysia unilira n.sp.

(*unus*, one; *lira*, a ridge between two furrows)
Plate X, figure 25

This species is proportionately much shorter than either *Grammysia obliqua* (McCoy) or *Grammysia cingulata* Hisinger. The basal margin is about parallel to the cardinal margin and the posterior margin is evenly rounded. The surface is ornamented by concentric irregular ridges and from the umbo to a little behind the middle of the basal margin, there descends a low ridge having a furrow on either side; each furrow broadens basally; the posterior furrow is the stronger. The left valve of *G. cingulata* has two radiating ridges and three furrows. *G. obliqua* has a single rather strong sulcus. A specimen of the left valve only is known.

Length 22 mm., height 17 mm.

Horizon and Locality. Very rare in zone c of the McAdam formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5454.

Grammysia cingulata mut. *intermedia* n. mut.

(*intermedius*, that lies between)
Plate XI, figures 6, 7

Species Reference:
1840. *Nucula cingulata* Hisinger, Leth. Suec. Supp., t. 39, figs. 1a, b.
1848. *Orthonota cingulata* Salter, Mem. Geol. Surv., Great Britain, 2, pt. 1, p. 360, Pl. 17, fig. 1, non fig. 2.
1855. *Grammysia cingulata* var. McCoy, Brit. Pal. Foss., p. 280.

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[1] Pal. N.Y., V, pt. 1, Lamell. II, p. 370.

Two specimens from the Moydart, moulds of the interior of the right valve, are referred to this mutation. They differ from *Grammysia obliqua* McCoy and resemble both *G. cingulata* (Hisinger) and *G. triangulata* (Salter), in having the sulcus descend to the middle of the basal margin and not to the postero-basal angle. They differ from *G. cingulata* and *G. triangulata* in having only one sulcus. The outline is intermediate between that of each of the last two named species. In one specimen, the beak is almost terminal as in *G. cingulata* and in the other it is a little farther back. Compared with the normal species, the posterior outline is somewhat more convergent, the dorsal margin inclining somewhat to the basal. The surface is not preserved, so that comparison on this basis cannot be made. Salter[1] states that intermediate forms occur at Dudley. *G. cingulata* ranges from the Wenlock to the upper Ludlow and *G. triangulata* is in the upper Ludlow.[2]

Length 55 mm., height 34 mm.

Horizon and Locality. Very rare in zone a of the Moydart formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 448; paratype, Cat. No. 448a.

Grammysia triangulata (Salter)
Plate XI, figure 5

1848. *Orthonota triangulata* Salter, Mem. Geol. Surv., Great Britain, 2, pt. 1, p. 361, Pl. 18, figs. 1-7.
1855. *Grammysia cingulata* var. *triangulata* McCoy, Brit. Pal. Foss., p. 280, Pl. 1k, fig. 28.
1874. *Grammysia rustica* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 139, Pl. 9, fig. 3.
1892. *Grammysia cingulata* var. *triangulata* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1913. *Grammysia triangulata* H. S. Williams, Proc. U.S. Nat. Mus., 45, p. 345, Pl. 31, fig. 17.
1915. *Grammysia rustica*, Bassler, Bull. U.S. Nat. Mus., 92, p. 567.
1915. *Grammysia triangulata* Bassler, Bull. U.S. Nat. Mus., 92, p. 567.

Original Description. "Sub-compressed, ovate-triangular, the beaks elevated and placed at the anterior third or fourth; oblique furrow single in the right valve, three approximate (sometimes obsolete) ones in the left; surface smooth, except the anterior side, which is strongly corrugated.

"Easily recognized by its triangular form, and the position of the elevated umbo, which, though variably placed, is always considerably behind the strongly plaited anterior side; the furrow likewise terminates considerably behind the middle of the ventral edge."

Grammysia triangulata (Salter) is closer to *G. cingulata* (Hisinger) than to *G. obliqua* (McCoy) and is probably derived from the former, resembling it in the number and position of the sulci and ridges. It differs from *G. cingulata* in form and sculpture; the outline is more triangular and the umbo is higher and tends to be more central in position; the obsolescence posteriorly of the concentric ridges and the presence of fine growth lines there are important diagnostic characters. The Arisaig specimens undergo the same variation in relative height and position of the umbo as the English shells. The most common Arisaig variety is that having nearly central beaks like figure 7 of Salter.

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[1] Mem. Geol. Surv., Great Britain, 2, pt. p. 1, 361, 1848.
[2] Brit. Pal. Foss., 1855, p. 346.

Horizon and Locality. Very rare in zones a, c, and d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 5455.

Grammysia remota Billings
Plate XI, figures 1 to 4

1874. *Grammysia remota* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 139, Pl. 9, fig. 2.
1892. *Grammysia remota* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Grammysia remota* Bassler, Bull. U.S. Nat. Mus., 92, p. 567.

Original Description. "Sub-ovate or sub-triangular, the height nearly equal to the length; beaks a little in front of the mid-length. The whole of the margin of the lower half of the shell is broadly rounded, or depressed semicircular. The anterior extremity is most prominent at about the mid-height; above which point it is gently convex or nearly straight in outline, and sloping towards the beaks; below the mid-height it gradually curves into the ventral margin. The hinge-line and dorsal margin slope downwards nearly to the mid-height of the shell, nearly straight or slightly concave. A lunette extends from between the beaks about two-thirds the length of the dorsal margin.

"Surface with rather strong concentric wrinkles from half to one line wide, covered with very fine concentric striæ.

"Length of the only specimen collected, twenty-six lines; height from the ventral margin to the beaks, twenty-two lines; depth of both valves, nine lines.

"The specimen is somewhat distorted and compressed laterally. When perfect the depth of both valves was probably twelve lines.

"From the beak of the right valve, a shallow groove extends almost vertically to the lower third."

Length 45 mm., height 42 mm.

Horizon and Locality. Very rare in zone c of the Stonehouse formation, near mouth of Stonehouse brook, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 3129; plesiotype, Cat. No. 5456.

Grammysia obliqua (McCoy)
Plate XII, figures 19, 20

1848. *Orthonota cingulata* Salter, Mem. Geol. Surv., Great Britain, 2, pt. 1, p. 360, Pl. 17, fig. 2.
1855. *Grammysia cingulata* var. Y. (*obliqua*) McCoy, Brit. Pal. Foss., p. 280.
1874. *Grammysia acadica* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 140, Pl. 9, figs. 4, 4a.
1892. *Grammysia acadica* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Grammysia acadica* Bassler, Bull. U.S. Nat. Mus., 92, p. 566.

Original Description. "Obliquely oval, anterior and posterior ends rounded; each valve with one very oblique, wide, deep sulcus, bounded by two obscure ridges running from the beak to a little in front of the obtusely rounded respiratory angle; surface with small irregular plicæ and striæ of growth, largest about the middle . . . . .

"The short elliptical form, and very oblique or backward running sulci, distinguish this rare species or variety perfectly. The above quoted figure of the Geological Survey is very good."

The single sulcus in both valves and its termination, not in the middle of the basal margin, but in the postero-basal angle, distinguish this species from *Grammysia cingulata* (Hisinger). *G. pembrokensis* H. S. Williams[1] is proportionately longer, the umbo is not so terminal in position, and the sulcus descends to the middle of the basal margin. The sulci vary in depth and breadth.

Length 55 mm., height 35 mm.
Length 50 mm., height 35 mm.

Horizon and Locality. Very rare in zone a and very common in zone c of the Stonehouse formation, coast section, Arisaig, N.S. Reported by Phillips and Salter from Llanbadoc, Usk district[2], where they state there are good exposures of the Aymestry and the Upper Ludlow.[3] McCoy lists it from the Upper Ludlow[4] of Westmoreland. *Grammysia pembrokensis* H. S. Williams is found in the Pembroke formation (Hersey red shale member), Maine, U.S.A.

Type. Peabody Museum of Yale University; plesiotype, Cat. No. 485.

Grammysia mcadamensis n.sp.
Plate X, figure 17

A small specimen is so designated. Elongate oval, very convex; high umbo; hinge-line straight; basal and anterior margins gently rounded; posterior margin obliquely truncate above; covered with even concentric wrinkles of growth. This species resembles the undulata group[5] of Devonian *Grammysia.*

Length 17 mm., height 10 mm.

Horizon and Locality. Very rare in zone c of the McAdam formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 446a.

Grammysia ? speciosa Billings
Plate XIX, figure 17

1874. *Orthonota ? speciosa* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 130, Pl. 8, figs. 3, 3a.
1915. *Orthonota speciosa* Bassler, Bull. U.S. Nat. Mus., 92, p. 923.

Original Description. "Transversely elongate, ovate; length about three times the height; beaks at about one-sixth the length from the anterior extremity. Dorsal and ventral margins sub-parallel, slightly converging posteriorly. Anterior extremity short, the margin broadly rounded up to the hinge-line with which it appears to form a right angle. Outline of the posterior extremity unknown, but apparently rounded. Ventral margin gently convex. Both valves are moderately convex. A narrow groove runs from the umbo backwards to the ventral margin, which it reaches a little behind the mid-length.

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[1] Proc. U. S. Nat. Mus., 45, 1913, p. 344, Pl. 31, fig. 2.
[2] Mem. Geol. Surv., Great Brit., 2, pt. 1, 1848, p. 361.
[3] Op. cit., p. 327.
[4] Brit. Pal. Foss., 1855, p. 346.
[5] Pal. N.Y., 5, pt. 1, Lamell. 2, p. 370.

"Surface on the anterior extremity with four or five strong concentric ridges. These remain single to a point nearly beneath the beak when their number is doubled by the intercalation of new ones, and apparently by the fission of one or two of the old. Proceeding backwards the surface markings become more and more obscure. The umbones are covered with neatly rounded concentric ridges, about five in one line on approaching the beaks, but becoming coarser, receding therefrom, down the sides. A set of fine rounded striæ radiate from the beak over the umbones, but disappear at about half the height of the shell. On the umbones there are five or six of those striæ in the width of one line.

"The oblique sulcus running from the umbones to the ventral margin is a character that would seem to ally this species to the genus *Grammysia*. In *Orthonota undulata* (Conrad) there is, however, a similar sulcus in precisely the same position."

Horizon and Locality. Very rare and probably from the Stonehouse formation, Arisaig, N.S.

Type. Victoria Memorial Museum; cotype, Cat. No. 3121.

Genus, *Cuneamya* Hall and Whitfield

1875. *Cuneamya* Hall and Whitfield, Pal. Ohio, 2, p. 90.
1894. *Cuneamya* Ulrich, Geol. Minn., 3, pt. 2, p. 620.

Ventricose, equivalve, inequilateral, subrhomboidal shells; beaks nearly anterior; hinge edentulous. Posterior cardinal slope inflected and has fine striæ of growth only; anterior surface has strong concentric plications. Well-defined lunule. Genotype, *Cuneamya miamiensis* Hall and Whitfield.

Cuneamya crassiornata n.sp.
(*crassus*, coarse, *ornatus*, adorned)
Plate X, figure 26

Compared with *Cuneamya arata* (Hall), the beaks are similarly anterior, but they curve forward rather than inward. The outline is proportionately a little shorter. The post-cardinal slope has fine growth lines. The surface of the remainder of the shell is covered with strong concentric ridges. The size is smaller than that of *C. arata.* The concentric ridges are more regular and stronger than in *Grammysia undata* (Sowerby) from the Upper Bala and Llandovery of Scotland; otherwise the resemblance in form is close. As the few specimens are badly crushed, the following measurements are only approximate:

Length 25 mm., height 13 mm.
Length 28 mm., height 14 mm.

Horizon and Locality. Very rare in zone b of the Ross Brook, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 446b.

Cuneamya arata (Hall)
Plate X, figures 13, 27

1860. *Leptodomus* (*Sanguinolites*) *aratus* Hall, Can. Nat. Geol. 5, p. 152.
1868. *Leptodomus* (*Sanguinolites*) *aratus* Dawson, Acad. Geol., 2d. ed., p. 603.
1915. *Leptodomus* (*Sanguinolites*) *aratus* Bassler, Bull. U.S. Nat. Mus., 92, p. 715.

Original Description. "Shell rhomboid-ovate, ventricose, beaks at the anterior third of the value, incurved and pointed forward, umbones gibbous, a slight depression from the umbo directly to the base of the shell, leaving a slight impression in the central margin; posterior slope subangular, the angle not defined; anterior slope with a defined angular ridge which borders a large cordiform lunette; anterior sharply rounded; basal margin nearly parallel with the hinge-line, curving upwards at the posterior extremity, and somewhat obliquely truncated from the cardinal line. Cardinal line straight posteriorly, with a wide and deep ligamental area. Surface marked by strong unequal ridges and furrows parallel to the basal margin, which become obsolescent on the posterior cardinal slope."

This species is very rare, being represented by only two specimens, one small and one large, in the collections of the Victoria Memorial Museum. The posterior slope is covered by very fine concentric striæ as contrasted with the rather coarse concentric ridges on the anterior surface.

Length 50 mm., height 22 mm.

Horizon and Locality. Very rare in zone c of the Stonehouse, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5453, 5452.

Cuneamya marklandensis n.sp.
Plate X, figures 11, 12

A rare, small, elongate species; beak anterior; umbo flattened, from which a broad, poorly-defined sulcus descends to the basal margin; hinge-line long, straight; basal margin long, slightly emarginate; anterior margin impressed, almost straight; posterior margin rounded; surface covered with relatively strong, even wrinkles of growth.

Length 15 mm., height 7 mm.

Horizon and Locality. Very rare in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 446.

Superfamily, Nuculacea
Family, NUCULIDAE Adams
Genus, *Nucula* Lamarck

1799. *Nucula* Lamarck, Prodr. Nouv. Class. Coq., Mem. Soc. Hist. Nat., Paris, p. 87.
1885. *Nucula* Hall, Pal. N.Y., 5, pt. 1, Lam. 2, p. xxvi.
1913. *Nucula* Dall, Zittel-Eastman Textb. Pal., 2d. ed., p. 440.

Transversely elliptical to trigonal, equivalve shells. A series of transverse teeth, both anterior and posterior to the beaks, are separated by a chondrophore. Pallial line simple. Genotype, *Arca nucleus* Linné.

Nucula arisaigensis n.sp.
Plate XII, figures 1 to 3, 7

The outline is longer than high; anteriorly well rounded and broad; posteriorly converging somewhat. The hinge-line is nearly straight and the basal and posterior margins well rounded. In these characters it resembles *Nuculana curta* Hind from the Bala and Lower Llandovery of Scotland. The characteristic feature of the Arisaig species, however, is the broadness of the umbo. As in many species of the genus the umbo rises rather high above the hinge-line and is incurved. A shallow sulcus begins midway from the beak and extends to the basal margin. The hinge-line is multidenticulate, and the moulds show a filling of what is probably the chondrophore. Pallial line entire. The anterior adductor is moderately impressed and the posterior deeply so. Exterior not known.

Length 21 mm., height 15 mm.
Length 17 mm., height 8 mm.

Horizon and Locality. Rare in zone c of the Stonehouse, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 5458; paratype, Cat. No. 5459.

Family, LEDIDAE Adams
Genus, *Palaeoneilo* Hall

1870. *Palaeoneilo* Hall, Prelim. Notice Lam., 2, p. 6.
1885. *Palaeoneilo* Hall, Pal. N.Y., 5, pt. 1, Lam. 2, p. xxvii.
1913. *Palaeoneilo* Dall, Zittel-Eastman Textb. Pal., 2d ed., p. 440.

Transversely elliptical to transversely ovate or subrostrate Ledidae, ornamented with concentric striæ. Escutcheon variably developed and bounded by a postcardinal ridge or scarp. Hinge-margin has a series of transverse teeth, which, below the beak, undergo a change in direction or are interrupted by oblique teeth. Ligament external and there is no clavicle as in *Nuculites* Conrad. Genotype, *Nuculites constricta* Conrad.

Palaeoneilo attenuata (Hall)
Plate XII, figures 8 to 10

1860. *Tellinomya attenuata* Hall, Can. Nat. Geol., 5, p. 151, fig. 11.
1868. *Tellinomya attenuata* Dawson, Acad. Geol., 2d. ed., p. 602, Fig. 208.
1892. *Ctenodonta attenuata* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Ctenodonta ? attenuata* Bassler, Bull. U.S. Nat. Mus., 92, p. 301.

Original Description. "Shell elongate, narrow, more than twice as long as high, anterior end short and rounded, beak elevated, situated a little in advance of the anterior third, posterior end narrow and abruptly rounded; basal margin slightly curved, and impressed posterior to the centre; posterior cardinal line straight but gradually declining; contour evenly convex. Surface concentrically striated, shell thick.

"This shell resembles the *T. machaeriformis*, but the anterior end is proportionally longer and more regularly round, the posterior narrower and more attenuated, and the convexity of the shell much greater. It is much smaller and proportionally more elongated than the *T. nasuta* of the Trenton limestone."

The hinge-margin is denticulate and bordered by a narrow escutcheon. The anterior adductor is posteriorly delimited by a low ridge which broadens above, but not in the manner of a buttress supporting the hinge-plate. The outline in general resembles that of *Palaeoneilo attenuata* Hall (non Hall 1860) from the Waverley sandstone, but the Arisaig species is more elongate, more pointed in outline anterior to the umbo, smaller, and the anterior adductor is delimited as described.

Length 24 mm., height 9 mm.
Length 16 mm., height 8 mm.
Length 22 mm., height 9 mm.
Length 19 mm., height 7 mm.

Horizon and Locality. Rare in zone b, common in zone c, and rare in zone d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5460, 5461, 5462.

Palaeoneilo antigonishensis n.sp.
Plate XII, figure 6

A small, elongate, ovate species, higher at the posterior end. Slightly convex; hinge-line long, slightly curved; posterior border rounded, obliquely truncate above; basal margin long, somewhat rounded; anterior margin well rounded; umbo very anterior in position and small; hinge-margin denticulate, but unknown below the beak; surface poorly preserved, apparently covered with small, irregular growth lines.

Length 16 mm., height 7 mm.

Horizon and Locality. Very rare, one specimen, in zone e of the Ross Brook, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 449b.

Palaeoneilo twenhofeli n.sp.
Plate XII, figure 14

A small species of which the left valve and a small part of the right is preserved. Moderately convex, longer than high; hinge-line short, about half the length; posterior border, long, straight, and obliquely truncate; basal margin gently rounded; anterior margin rounded, somewhat obliquely truncate above; umbo small, posterior to the middle; postumbonal slope angular; hinge-margin denticulate. This species is named for Professor W. H. Twenhofel of the University of Wisconsin.

Length 10 mm., height 7 mm.

Horizon and Locality. Very rare in zone b of the Stonehouse, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 449e.

Genus, *Tancrediopsis* Beushausen

1895. *Tancrediopsis* Beushausen, Abhand, d. Kongl. Preuss. geol. Landes., N.F., 17, p. 94.
1913. *Tancrediopsis* Prosser, Mid. and Upper Devonian, Md. Geol. Surv., p. 245.

A well-defined group of Silurian and Devonian time. Small shells. Typically of subrectangular outline, expanding anteriorly. The umbo is posterior to the middle and the postumbonal slope is straight and angular. Posterior border obliquely truncate. Ornamented with concentric striæ. Hinge-line long and almost straight; strong transverse teeth on either side of the beak; hinge below the beak not known. Genotype, *Ctenodonta subcontracta* Beushausen.

Tancrediopsis altistriata n. sp.
(*altus*, elevated)
Plate XII, figures 4, 5

A shell of moderate size for the genus. Outline subrectangular, expanding fairly rapidly anteriorly. Moderately convex, anterior margin rounded, descending rapidly below; basal margin almost straight; posterior margin straight and obliquely truncate. Hinge-line long, almost equal to length of the shell. Beaks a little posterior to the middle. Postumbonal slope angular and straight, descending to the postero-ventral angle. Teeth transverse, rather widely spaced and on either side of the beak; hinge below beak unknown. Only two specimens known; one, the holotype, is of the left valve and well preserved; the other, the paratype, is a flattened right valve.

It has a straighter basal margin than *Tancrediopsis cuneata* (Simpson)[1] and is smaller and less constricted posteriorly than *T. diminuens* (Simpson).[2] It is not so rostrate as *T. raricosta* (Chapman)[3] and *T. spectabilis* (Chapman)[4] from the Victoria, N.S.W., Silurian and is intermediate in this respect between them and *T. victoriae* (Chapman).[5] In the Arisaig species, the lamellose striæ are not so regularly arranged.

Length 17 mm., height 7 mm.

Horizon and Locality. Very rare (2 specimens) in zone d of the Ross Brook formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 449; paratype, Cat. No. 449a.

Tancrediopsis mundiornata n. sp.
(*mundus*, neat; *ornatus*, adorned)
Plate XII, figure 12

Compared with *Tancrediopsis altistriata* n. sp., this shell is larger and has finer, more closely arranged, and more regularly arranged striæ. The outline is much the same but it does not expand so rapidly anteriorly. The beak is somewhat posterior to the middle and there is an angular ridge from the umbo to the postero-basal angle. As only one specimen is known, of the left valve, the variation cannot be described.

Length 23 mm., height 9 mm.

Horizon and Locality. Very rare in zone d of the Ross Brook, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 449d.

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[1] Trans. Amer. Phil. Soc. N.S., 16, 1890, p. 453, text fig. 21.
[2] " " " " " " " " 22.
[3] Mem. Nat. Mus. Melbourne, No. 2, 1908, p. 34, Pl. 3, fig. 50.
[4] " " " " " " p. 35, Pl. 3, figs. 51, 52.
[5] " " " " " " p. 33, Pl. 3, figs. 47–49.

Tancrediopsis lauta n. sp.
(*lautus*, trim)
Plate XII, figure 11

A trim little shell, of which the right valve is preserved. Fairly convex; beak small, posterior to the middle; postumbonal slope angular; hinge-line long, straight; anterior margin rounded; posterior margin, obliquely truncate; basal margin long, very gently rounded; hinge unknown; surface covered with relatively strong and even concentric ridges. It is smaller, more convex, and has relatively stronger and more even concentric ridges than *T. mundiornata* or *T. altistriata* n. sp. Hinge not preserved.

Length 7 mm., height 2½ mm.

Horizon and Locality. Very rare, one specimen, in zone b of the McAdam formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 449c.

Genus, *Nuculites* Conrad

1841. *Nuculites* Conrad, 5th Ann. Rept. N.Y. Geol. Surv., p. 49.
1851. *Cucullella* McCoy, Ann. Mag. Nat. Hist., ser. 2, 7, p. 50.
1885. *Nuculites* Hall, Pal. N.Y., 5, pt. 1, Lam. 2, p. 26.

Inequivalve, elongate, and in some specimens rostrate, shells with concentric striæ. Hinge has a continuous row of transverse teeth. In the majority of the Arisaig specimens the hinge below the beak is not preserved, but an etched specimen of *Nuculites cawdori* var. *elongatus* (Hall) shows that the teeth are smaller there than in front or behind. The hinge-plate is supported by a clavicle or buttress. The escutcheon is narrow, but present in all the Arisaig specimens. Genotype, *Nuculites oblongatus* Conrad.

Nuculites concentricus (Hall)
Plate XII, figures 15, 18; Plate XXIX, figure 11

1860. *Clidophorus concentricus* Hall, Can. Nat. Geol., 5, p. 149, Fig. 7.
1868. *Clidophorus concentricus* Dawson, Acad. Geol., 2d. ed., p. 600, Fig. 204.
1892. *Clidophorus concentricus* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Clidophorus concentricus* Bassler, Bull. U.S. Nat. Mus., 92, p. 232.

Original Description. "Shell sub-equilateral, very broadly oval-ovate, the anterior end the broader; height nearly four-fifths the greatest length; anterior side a little shorter and more broadly rounded at the extremity; a slight depressed sinus on the posterior umbonal slope, which is more anterior than in the preceding species. Surface marked by even, band-like concentric striæ; shell thin; a linear curving clavicle extends from the cardinal line just anterior to the beak more than halfway to the base.

"The prominent points of distinction between this and the preceding shell are the nearly central beaks, the band-like striæ, and the curving clavicle with the broad and nearly equal extremities of the valve."

In some specimens the post-umbonal slope is smoothly rounded, and in others is slightly modified by low folds, separated by a broad, shallow sinus, stronger near the basal margin. The basal margin is straight or a little concave opposite the sinus. The concentric striæ are fine and evenly spaced. The clavicle curves forward. The species differs from the var. *subovatus* (Hall) in the less proportionate length and nearly central umbo. In Hall's figured specimen the denticulate hinge-margin is buried in the rock matrix. The single specimen from the McAdam is small.

Length 33 mm., height 27 mm.
Length 29 mm., height 23 mm.
Length 27 mm., height 20 mm.
Length 26 mm., height 22 mm.

Horizon and Locality. Very rare (1 specimen) in zone b of the McAdam, and very rare in zone a, rare in zone b, very common in zone c, and rare in zone d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotype, Cat. No. 5463: Peabody Museum of Yale University; plesiotype, Cat. No. 450.

Nuculites concentricus var. *subovatus* (Hall)

Plate XII, figures 13, 16, 17; Plate XIII, figures 27 to 30; Plate XXVIII, figure 14; Plate XXX, figures 2, 3, 11

1860. *Clidophorus subovatus* Hall, Can. Nat. Geol., 5, p. 151.
1868. *Clidophorus subovatus* Dawson, Acad. Geol., 2nd. ed., p. 602.
1892. *Clidophorus subovatus* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Clidophorus subovatus* Bassler, Bull. U.S. Nat. Mus., 92, p. 233.

As here interpreted, this variety includes all elongate shells, both those which have subterminal beaks and posteriorly directed clavicles, and those which have less anterior beaks and forward sloping clavicles. It was the intention to recognize these two extremes of variations as separate varieties, but since the lectotype of *C. subovatus* Hall in the American Museum of Natural History is intermediate in these characters, it was necessary, in order to recognize the lectotype, to refer all the elongate specimens to var. *subovatus* (Hall). It is not improbable that Hall's species *C. cuneatus* fell within this variety; but since even the lectotype of that species is gone, the description is poor, and no figure was ever given, it is not possible to identify *C. cuneatus* Hall.

The specimens of this variety having the beaks remote from the anterior end and forward directed clavicles, pass into the species by reduction in length. Those having subterminal beaks and posteriorly directed clavicles pass into var. *subequilatus* by reduction in length. All intermediate stages occur.

Length 32 mm., height 22 mm.
Length 37 mm., height 20 mm.
Length 32 mm., height 19 mm.
Length 33 mm., height 21 mm.
Length 37 mm., height 23 mm.

Horizon and Locality. Very rare in zone b of the McAdam, very rare in zone a of the Moydart, rare in zone b, very common in zone c, and common in zone d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5467, 5466, 5471, 5470, 5468, 5469.

Nuculites concentricus var. *subequilatus* n. var.
(*sub*, about, near to; *equilatus*, equilateral)
Plate XIII, figures 25, 26

This variety resembles *Nuculites concentricus* (Hall), in its semiquadrate outline, but has the umbo terminal and the curving clavicle directed posteriorly, as in the subterminal-beaked specimens of *var. subovatus* (Hall). As in the latter, also, the cardinal margin is parallel to the basal margin or both diverge posteriorly. It differs from the sub-terminal beaked form of var. *subovatus* in the shorter length, and all gradations exist. As in all forms of the species the shell is relatively depressed as compared with *N. cawdori* (Salter) and its varieties. In some specimens the post-umbonal slope is modified by low folds and a shallow sinus. A few have the lower fold quite strongly developed and the margin somewhat produced around it. The upper fold is low, however, and the posterior margin curves gently around it. The posterior margin is concave opposite the shallow sinus and obliquely truncate above the upper fold.

Length 29 mm., height 25 mm.
Length 23 mm., height 20 mm.

Horizon and Locality. Common in zone c and very rare in zone d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 5464; paratype, Cat. No. 5465.

Nuculites cawdori (Sowerby)
Plate XIII, figures 1 to 3

1839. *Cucullaea cawdori* Sowerby, Murchison's Sil. Syst., p. 602, Pl. 3, fig. 11.
1859. *Cucullella cawdori* Salter, Murchison's Siluria, 3d. ed., Pl. 34, fig. 3.

Original Description. ''Transversely elliptical, convex, posteriorly obliquely truncated; a rounded ridge extends from the nearly central beak to the posterior angle of the margin; internal laminæ oblique; length 4 lines, width 7 lines.

"This shell is named after the Earl of Cawdor who found it."

This species belongs to a group of species, including *Nuculites cuneiformis* Conrad and *N. triqueter* Conrad, which attains its full development in the middle of the Silurian and continues into the Devonian. Contrasted with the group of *N. oblongatus* Conrad, the umbo is more prominent and the post-umbonal slope more convex and more strongly modified. The post-cardinal ridge is angular and demarcates an abruptly inflected post-cardinal slope, which broadens posteriorly. Below this there may be a sinus, and a weak post-umbonal ridge or fold may radiate to the postero-basal angle. The posterior border is concave at the sinus, convex above at the ridge, and thence obliquely truncate across the post-cardinal slope and narrow escutcheon to the denticulate hinge-margin. The peculiar projection at the post-cardinal ridge and the sinuosity below point to the existence of a siphonal tube or at least some modification of the mantle.

In *Nuculites cawdori* (Sowerby), the umbo is almost central, the length is greater than the height, the basal margin is broadly, not sharply, rounded and is posteriorly straightened or sinuate opposite the sinus on the post-umbonal slope. The whole expression is rectangular, although the shell is somewhat broader anteriorly. The clavicle curves forward. At Arisaig this species undergoes considerable variation. By increase in proportionate height, it passes into var. *erectus* Hall and by anterior migration of the beaks it grades into var. *elongatus* Hall.

The figures given below demonstrate the variation in size and length of the species.

Length 25 mm., height 16 mm.
Length 22 mm., height 18 mm.
Length 20 mm., height 12 mm.
Length 20 mm., height 14 mm.
Length 16 mm., height 12 mm.
Length 15 mm., height 12 mm.
Length 15 mm., height 11 mm.
Length 12 mm., height 11 mm.

It is possible that Hall gave to this form the name of *Clidophorus nuculiformis*. As, however, the description of that species is poor, it is not figured, and the type is lost, no certain identification of it can be made.

Horizon and Locality. Very rare in zone b and rare in zone c of the McAdam, rare in zone b, common in zone c, and rare in zone d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S. Also found in the Ludlow of England.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5472, 5474: Peabody Museum of Yale University; plesiotype, Cat. No. 484.

Nuculites cawdori mut. *rossonia* n. mut.

Plate XIII, figures 4, 5; Plate XXX, figure 6

This mutation has the elongate subrectangular outline and subcentral beaks of the species. The umbones too are large and prominent. It differs from the normal species in the simpler post-umbonal slope on which the post-cardinal ridge and slope are not yet developed. The posterior border, too, is more evenly rounded. It is probably a precursor of the species; for *N. cawdori* and its varieties do not appear until the McAdam. The hinge-line is almost straight and is denticulate. The clavicle is curved and directed forward. One of the two known specimens has the beak a little more anterior than the other, as in the var. *elongatus* (Hall). The umbones are too prominent for it to be a forerunner of the *N. concentricus* stock.

Length 12 mm., height 8 mm.

Horizon and Locality. Very rare (two specimens) in zones d and e of the Ross Brook, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 451a; paratype, Cat. No. 451.

Nuculites cawdori var. *elongatus* (Hall)

Plate XIII, figures 6 to 11

1860. *Clidophorus elongatus* Hall, Can. Nat. Geol., 5, p. 150, fig. 9.
1868. *Clidophorus elongatus* Dawson, Acad. Geol., 2nd ed., p. 601, Fig. 206.
1892. *Cucullella elongata* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Clidophorus elongatus* Bassler, Bull. U.S. Nat. Mus., 92, p. 232.

Original Description. "Shell subelliptical, length about twice the height, beaks much nearer to the anterior end, which is narrowly rounded; umbones rounded, prominent; a defined, gradually widening depression extends from the umbo to the posterior basal margin, causing a straightening or slight sinuosity in the edge of the shell; a defined ridge along the posterior slope between the sinus and the cardinal margin. Surface very finely striated. A slender clavicle extends from the anterior cardinal margin a little more than half-way to the base, and curving slightly forward.

"This species differs externally from all the others in the greater proportional length and in the rounded umbones.

"The *C. cuneatus* of the same size is a stronger and proportionally higher shell, having a less defined sinus on the posterior slope, and a much stronger clavicle."

Most of the post-cardinal slope and denticulate hinge-margin of Hall's specimens are buried in the rock matrix. His figure, therefore, shows a too converging posterior outline. As in the species, the posterior end is more narrow than the anterior, is a little produced at the post-cardinal ridge, is sinuate below, and obliquely truncate above. It is not proportionately longer than other species of the genus at Arisaig, being equalled in that respect by *Nuculites concentricus* var. *subovatus* (Hall). It is a more variable shell than Hall's description would imply, grading on the one hand into the species and on the other into the var. *erectus* (Hall). Migration forward of the umbo of *N. cawdori* (Sowerby) gives rise to the typical form of the variety as described and figured by Hall. This is an elongate form, having the umbo anterior, but not terminal, and the clavicle directed forward. Further migration forward of the beak gives rise to a form nearer var. *erectus* (Hall); this second expression has the beak terminal and the clavicle directed posteriorly; by shortening in the direction of the hinge-margin, this passes into the var. *erectus* (Hall).

Nucula coarctata Phillips[1] has the characteristic post-cardinal ridge and slope of the Arisaig variety, but is much shorter in outline; some of the shorter forms of this variety are practically identical with Phillips species, however. *N. cuneiformis* Conrad is a longer shell and lacks the sinus in front of the post-cardinal ridge. *N. triqueter* Conrad is shorter and has a more feeble sinus on the post-umbonal slope.

Length 22 mm., height 12 mm.
Length 20 mm., height 11 mm.
Length 18 mm., height 13 mm.
Length 18 mm., height 11 mm.
Length 17 mm., height 12 mm.
Length 14 mm., height 7 mm.
Length 13 mm., height 11 mm.

Horizon and Locality. Rare in zone b and common in zone c of the McAdam, very rare in zone b, common in zone c, and rare in zone d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5475 to 5480.

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[1] Mem. Geol. Surv., Great Britain, 2, pt. 1, 1848, p. 366, Pl. 22, figs. 1-4.

Nuculites cawdori var. *erectus* (Hall)
Plate XIII, figures 12, 13; Plate XXVIII, figure 13

1860. *Clidophorus erectus* Hall, Can. Nat. Geol., 5, p. 149, Fig. 8.
1868. *Clidophorus erectus* Dawson, Acad. Geol., 2d. ed., p. 600, Fig. 295.
1892. *Clidophorus erectus* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Clidophorus erectus* Bassler, Bull. U.S. Nat. Mus., 92, p. 232.

Original Description. "Shell somewhat rhomboid-ovate, the height and length about equal; umbones prominent, beaks nearer the anterior end, somewhat curved and elevated; posterior cardinal line curving, with a scarcely defined ridge along the umbonal slope; basal margin strongly rounded, sinuate on the postero-basal margin and regularly rounded, with a scarcely defined ridge extending down the slope just anterior to the clavicle. Surface finely striated concentrically, a slightly curving clavicle extending from the cardinal line nearly two-thirds the distance to the anterior basal margin.

"This species differs from the preceding in the equal length and breadth and consequent greater proportional height, in the sinuosity of the postero-basal margin, and more abruptly-rounded basal outline, and the curving forward of the beaks."

Compared with *Nuculites cawdori* (Sowerby), the shells of this variety are proportionately shorter and higher, the cardinal slopes are steeper, and the basal margin is shorter and more strongly arched. By decrease in height and increase in length, it merges into *N. cawdori.* By increase in length along the hinge-line it passes into that form of *N. cawdori* var. *elongatus* (Hall) which has a terminal umbo and a posteriorly directed clavicle.

Length 13 mm., height 13 mm.
Length 8½ mm., height 9½ mm.

Horizon and Locality. Rare in zone c of the McAdam, common in zone c and rare in zone d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5592 3104a.

Nuculites honeymani n.sp.
Plate XIII, figure 14

A specimen so designated resembles *N. cawdori* (Sowerby) closely in, size, elongation, position of beak, and sinus below the postumbonal fold; it differs in having a rostrate posterior outline.

Length 23 mm., height 12 mm.

Horizon and Locality. Very rare, one specimen, in zone c of the McAdam formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 451b.

Nuculites novascoticus n.sp.
Plate XIII, figure 15

A small species of which only a mould of the interior of the right valve is known. Small; elongate, subrectangular in outline; beak situated nearly one-third from the anterior end; anterior margin rounded; posterior margin rounded, descending posteriorly; basal margin very gently rounded; hinge-margin posterior to the beak, straight, long, and inclined; hinge-margin anterior to beak, short, inclined, not well preserved; clavicle slender, short, almost perpendicular; fine transverse teeth preserved posterior to the beak.

Length 11 mm., height 8 mm.

Horizon and Locality. Very rare, one specimen, in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 6032.

Nuculites sp.

Plate XIII, figure 16

There is a small specimen in the Stonehouse which cannot be placed in any of the recognized species of *Nuculites.* It is higher than long, somewhat ovate; has well-defined beaks, turned forward and also incurved. A narrow, curved clavicle extends nearly half the length of the shell. Surface covered with very fine, even, concentric striations. Dentition unknown.

Length 12 mm., height 17 mm.

Horizon and Locality. Very rare, one specimen, in zone b of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; Cat. No. 541c.

Genus, *Arisaigia* McLearn

1918. *Arisaigia* McLearn, Am. Jour. Sci., vol. 45, Feb., 1918, p. 139.

Elongate, in some specimens rostrate, shells having a denticulate hinge and in the earlier forms, a clavicle, as in *Nuculites* Conrad. Differs from *Nuculites* by having sinuous and closely set radiating striæ on the post-umbonal slope. As here interpreted, it includes certain shells in the later Silurian which differ from the type by having a definite escutcheon and area delimited by scarps, and by the absence of a clavicle. The clavicle of *A. postornata,* the earlier species, however, is not well developed in all specimens. Another shell that may be assigned to this genus is *Nucula sinuosa* Simpson[1] from the Clinton (?) of Mifflin co., Penn.; it has a similar denticulate hinge-margin, radiating striæ on the post-umbonal slope, and as Simpson's figure[2] distinctly shows, a curving clavicle. Genotype, *Arisaigia postornata* McLearn.

The Arisaig species are:

Early Typical Species:

- *Arisaigia postornata* McLearn; in the McAdam
- *A. postornata* var. *brevis* n. var.; in the McAdam

Later Modified Species:

- *A. placida* (Billings); in the Stonehouse
- *A. placida* var. *socialis* (Billings); in the Stonehouse

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[1] Trans. Am. Phil. Soc., n. ser., 16, 1890, p. 451, text fig. 19.

[2] Op. cit. fig. 19, p. 451.

Arisaigia postornata McLearn

(*post*, rear; *ornatus*, adorned)
Plate XIV, figure 19

1918. *Arisaigia postornata* McLearn, Am. Jour. Sci., vol. 45, Feb., 1918, p. 139.

In structural generic characters this species resembles *Arisaigia sinuosa* (Simpson) and with it represents the earlier development of the genus in which no definite scarp extends from the umbo to the posterobasal angle. It differs from *A. sinuosa* chiefly in form; it is longer and only slightly convergent posteriorly, the post-cardinal margin being almost parallel to the basal margin. As in the Pennsylvania species, the post-umbonal slope is modified into a gently convex fold and below there is a radiating furrow. The Arisaig species has in addition a second low fold and in many specimens a second shallow sinus in front of it. The posterior margin is produced at the first fold, sinuate below, and obliquely truncate above. A few specimens approach the later development represented by *A. placida*, in the flattening of the upper fold and furrow and the tendency to emphasize the contact between that furrow and the lower fold. The upper, and to some extent the lower, folds are covered with radiating, somewhat sinuous, closely arranged striæ which are coarser than the concentric ones that cross them. The remainder of the surface is covered with the concentric striæ only. The umbo is moderately elevated and situated about one-fifth to one-third the distance from the anterior margin. The clavicle is variably developed and, on the whole, more strongly so in the earlier specimens. In part the absence is due to lack of preservation.

Length 37 mm., width 17 mm.
Length 27 mm., width 12 mm.
Length 20 mm., width 12 mm.
Length 20 mm., width 9½ mm.

Horizon and Locality. Rare in zone b and very common in zone c of the McAdam formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5608.

Arisaigia postornata var. *brevis* n. var.

(*brevis*, short)
Plate XIV, figure 14

1892. *Cytherodon* ? n.sp. Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.

This is a short, almost equilateral variation of the species and has the same ornamentation on the post-umbonal slope. The umbo is a little anterior to the middle. The hinge-line is almost parallel to the basal margin. This variety is connected with the species by intergrading forms.

Length 20 mm., height 15 mm.
Length 17 mm., height 14 mm.
Length 16 mm., height 14 mm.
Length 14 mm., height 12 mm.

Horizon and Locality. Very common in zone c of the McAdam formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 487.

Arisaigia placida (Billings)
Plate XIV, figures 13, 16

1874. *Cytherodon ? placidus* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 137, Pl. 8, fig. 10.
1892. *Cytherodon ? placidus* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Cytherodon ? placidus* Bassler, Bull. U.S. Nat. Mus., 92, p. 374.

Original Description. "Cast of the interior of the right valve, oblong or broadly sub-ovate; length one-fifth greater than the height at the umbones; depressed convex; beaks a little behind the anterior third; anterior extremity broadly rounded; ventral margin gently convex in the middle three-fourths, broadly rounded up to the anterior extremity, more abruptly curved up to the posterior margin; dorsal margin occupying about the middle half of the whole length of the shell; parallel to the ventral margin nearly straight or slightly convex. The lower half of the posterior margin is gently convex; the upper half straighter and sloping to the posterior end of the hinge-line.

"From the beak a nearly straight fold runs down to the basal margin, which it reaches at a point between the posterior fifth and sixth. Another similar fold runs to the posterior margin a little above the mid-height. Behind each of these folds the surface is slightly depressed, making two step-like descents backwards.

"The dorsal margin, above the last fold, is compressed, slightly concave. Just below the hinge-line there is a row of, apparently, twelve to fifteen impressions of small teeth, which slope upwards and slightly backwards. No teeth can be seen in front of the beaks. Surface of the cast, with impressions of fine concentric striæ, apparently six or seven in two lines.

"Length sixteen lines, height at the umbones ten lines."

Compared with *Arisaigia postornata* var. *brevis* n. var., this species is larger, there is a definite area, and escutcheon definitely delimited by radiating scarps. The escutcheon and upper part of the adjacent delimited surface, or area, are ornamented with radiating sinuous striæ rather closely arranged and similar to those of *A. postornata* McLearn and its variety. The entire surface is covered with concentric striæ, smaller than the radiating ones. There is no clavicle.

Length 28 mm., height 23 mm.

Horizon and Locality. Common in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 3128; plesiotype, Cat. No. 5610.

Arisaigia placida var. *socialis* (Billings)
Plate XIV, figures 15, 18

1874. *Cytherodon ? socialis* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 138, Pl. 8, fig. 12.
1892. *Cytherodon ? socialis* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Cytherodon ? socialis* Bassler, Bull. U.S. Nat. Mus., 92, p. 374.

Original Description. "Transversely elongate ovate; length nearly thrice the height; moderately convex; beaks between the anterior fifth and fourth; anterior extremity rounded, from three-fourths to seven-eighths of the whole height; ventral margin gently convex; hinge-line straight, a little more than half the length between the beaks and the posterior end. A shallow groove runs from the beaks backwards and downwards, to the lower posterior angle. The surface, as seen in the casts of the interior, is slightly depressed above the groove. A second depression occupies a small space below the hinge-line, and somewhat resembles a long lunette. The posterior extremity is either doubly truncated or irregularly rounded.

"Surface with fine rounded striæ, four or five in one line, and also with obscure concentric wrinkles, not always seen on the casts.

"Length of large specimens about 2 inches; height eight or nine lines. Individuals of all sizes from nine lines in length upwards occur.

"The position of the beak varies, from one-fifth to three-eighths the length from the anterior extremity. The posterior part of the shell is often more narrowed and pointed, from the beaks backwards, than it is in the specimen figured; sometimes more obtuse and uniformly rounded."

This is an elongate expression of the species, with which it is connected by intergrading forms. It is more abundant.

Length 42 mm., height 18 mm.
Length 55 mm., height 32 mm.
Length 38 mm., height 17 mm.
Length 32 mm., height 13 mm.
Length 25 mm., height 12 mm.

Horizon and Locality. Rare in zone b and very common in zone c of the Stonehouse, coast section, and common in zone d of the Stonehouse in the Stonehouse Brook section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5611, 5612.

Genus, *Tropinuculites* McLearn

1918. *Tropinuculites* McLearn, Am. Jour. Sci., vol. 45, Feb., p. 140.

This genus resembles *Nuculites* Conrad, but has a scarp extending from the umbo to the postero-basal angle. Above the scarp the surface is covered with very fine concentric striæ and lacks there the radiating striæ of *Arisaigia* McLearn. In front of the scarp the surface has ornamental concentric ridges. A narrow escutcheon lies above the finely striate area and borders the hinge-margin. As in *Nuculites* the hinge-margin is denticulate and a clavicle is present. Genotype, *Nuculites* (*Orthonota*) *carinata* Hall.

Tropinuculites carinatus (Hall)

Plate XIV, figures 17, 20; Plate XXX, figure 10

1860. *Nuculites* (*Orthonota*) *carinata* Hall, Can. Nat. Geol. 5, p. 151, Fig. 10.
1868. *Nuculites* (*Orthonota*) *carinata* Dawson, Acad. Geol., 2d. ed., p. 602, Fig. 207.
1915. *Nuculites* (*Orthonota*) *carinatus* Bassler, Bull. U.S. Nat. Mus., 92, p. 859.

Original Description. "Shell extremely elongate, nearly three times as long as wide; sides sub-parallel; hinge-line straight, beaks appressed, sub-anterior, the anterior extremity rounded; posterior extremity obliquely truncate, longer on the hinge-line than on the basal margin. Surface marked by a sharp carina which extends from the umbo obliquely to the postero-basal angle, the space anterior to this carina marked by distinct elevated lamellose striæ, and intermediate finer ones. The space between this and the cardinal line smooth and slightly depressed. Cardinal line anterior to the beak showing six or seven crenulations. A strong clavicle extends from the anterior cardinal line with a gentle curve nearly to the base of the shell."

The surface above the scarp has very fine concentric striæ. The hinge-margin is bounded by a narrow escutcheon. A broad, shallow depression lies in front of the scarp, opposite which the basal margin is slightly sinuate. The surface sculpture and sinuate basal margin resemble *Sanguinolites decipiens* McCoy, but the latter is shorter and no denticulate hinge-margin or clavicle is described for it.

Length 25 mm., height 10 mm.
Length 23 mm., height 11 mm.
Length 22 mm., height 11 mm.

Horizon and Locality. Common in zone c of the Stonehouse, coast section, and rare in zone d of the Stonehouse formation, Stonehouse Brook section, Arisaig, N.S. *Sanguinolites decipiens* McCoy has been reported from the upper Ludlow of Westmoreland, England.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5613, 5614.

Genus, *Leda* Schumacher

Equivalve, transverse, rostrate shells produced posteriorly. Striation concentric. Hinge has minute transverse teeth. Chondrophore as in *Nucula*. Genotype, *Arca rostrata* Chemn.

Leda megumaensis n.sp.
Plate XX, figure 11

A species of average size, about twice as long as high. Beak slightly in advance of the middle, turned posteriorly. Shell anteriorly wide and rounded; posteriorly rostrate, but not produced. Moderately convex, post-umbonal slope angular. Hinge anterior to the beak and has very fine transverse teeth, inclined slightly forward. Surface is preserved near ventral border of holotype and shows very fine concentric striations.

Length 18 mm., height 9·5 mm.

Horizon and Locality. Very rare, one specimen, in zone b of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 461.

Genus, *Honeymania* McLearn

1918. *Honeymania* McLearn, Am. Jour. Sci., vol. 45, p. 138.

The characteristics of the genus are the flattened post-cardinal border, resembling that of some Limopsidae Dall and some Lunulicardiidae Fischer, and the specialized nature of the taxodont dentition. It is smaller and less ornate than the Silurian Lunulicardiidae which are much larger and have radial sculpture. Posterior to the beak two transverse teeth are preserved. Anterior to it are one or two rows of much smaller transverse teeth. The hinge below the beak is not known. It is not likely that *Honeymania* possess an amphidetic area of the Arcacea type. Compared with *Cytherodon* Hall, the size is smaller, the post-cardinal border is more flattened and delimited by an abrupt inflexion of the post-umbonal slope, the teeth are more numerous, there are only a few posterior to the beak, and there is a marked contrast in their arrangement and size anterior and posterior to it. The *Cytherodon* dentition consists of four or five transverse teeth below and in front of the beaks. Genotype, *Honeymania planimarginata* McLearn.

This genus shows some resemblance to *Cardiolaria* Munier-Chalmas[1] of the French Silurian; but the transverse teeth on either side of the beak in that genus diverge at a considerable angle and are not sub-parallel as in *Honeymania;* moreover, the large and deeply impressed muscles and the narrow flattened area along the postero-dorsal margin, which are so marked features in *Honeymania,* are lacking in *Cardiolaria. Cardiolaria* probably has a thicker shell than *Honeymania.*

The genus is provisionally placed in the family Ledidae of the Nuculacea.

The genus name is given in honour of Rev. David Honeyman, who took such a prominent part in the early study of this locality and its fauna.

Honeymania planimarginata McLearn
(*planus*, flat)
Plate XIII, figures 19 to 21

1892. *Ambonychia* ? n.sp. Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 190.
1918. *Honeymania planimarginata* McLearn, Am. Jour. Sci., vol. 45, p. 139.

Outline somewhat mytiliform, moderately and evenly convex, the basal and anterior margins rounded and not sinuous. On the post-cardinal slope, the surface is abruptly inflected, descending to an almost flat expansion of the shell along the post-cardinal border. The margin is slightly flattened anterior to the beak. The hinge is short, and, for the most part, obscured by the umbones which rise above it. Posterior to the beak are two large teeth and anterior to it a longer row of very small numerous teeth. Both anterior and posterior adductors well impressed, equal in size, but small. Pallial line not known.

Length 10 mm., height 12 mm.

Horizon and Locality. Very rare in zone c of the McAdam, McAdam Brook and coast sections, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 5604; paratype, Cat. No. 5605.

Honeymania elongata n.sp.
(*elongatus,* lengthened; pp. of *elongo*)
Plate XIII, figures 22 to 24

Compared with *Honeymania planimarginata* McLearn, this is a longer shell, being produced in the direction of the post-cardinal ridge.

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[1] Bull. Soc. Géol. France, 3e sér., tome 17, p. 709.

One of the specimens shows that the teeth anterior to the beak are in two parallel series.

Length 12 mm., height 8 mm.

Horizon and Locality. Rare in zone c of the McAdam, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 5606; paratype, Cat. No. 5607.

Family, AVICULIDAE
Genus, *Pterinea* Goldfuss

1826. *Pterinea* Goldfuss, Petrefacta Germaniae, p. 133.
1908. *Pterinea* H. S. Williams, Proc. U.S. Nat. Mus., 34, pp. 83-90.
1913. *Pterinea* Dall, Zittel-Eastman Textb. Pal., 2nd. ed., p. 444.

Although a great deal has been accomplished in the revision of Goldfuss' genus *Pterinea*, some difficulty is experienced in using the new genera which have been proposed. Even Williams has trouble in using his own genera.[1] The Arisaig material is too poor to form a basis for any further revision. It is thought best, therefore, to use the genus *Pterinea* in the old sense, i.e., to include all dimyarian *Pteriacea* having the *Pterinea* shell form, having both smooth and radially striate surface and both resupinate and convex right valves. The genus is thus given a very broad interpretation. As the dentition and the muscle scars are not preserved, there may be some confusion with monomyarian genera, e.g. *Actinopteria*, etc. Genotype, *Pterinea laevis* Goldfuss.

Pterinea emacerata var. *arisaigensis* n. var., on account of its radially striate left valve and apparently resupinate smooth right valve, comes close to genus *Tolmia* H. S. Williams, but the anterior wing is rather too well defined for that genus. In *Pterinea prominiradiata* n.sp., the right valve is apparently resupinate; this character, the short posterior wing, and the radiating striæ on the right valve, suggest subgenus *Follmanella* H. S. Williams. *Pterinea honeymani* (Hall), if dimyarian, has the characters of subgenus *Actinopterella* H. S. Williams; for both valves are convex. If, however, this species is monomyarian then it is of the genus *Actinopteria*.

Pterinea emacerata var. *arisaigensis* n. var.
Plate XIV, figures 3, 4

1892. *Pterinea emacerata* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 190.
Species Reference:
1842. *Avicula emacerata* Conrad, Jour. Acad. Nat. Sci. Phil., p. 241, Pl. 12, fig. 15.
1852. *Avicula emacerata* Hall, Pal. N.Y., 2, p. 83, Pl. 27, figs. 1a-b; p. 282, Pl. 59, figs. 1a-e.
1915. *Pterinea emacerata* Bassler, Bull. U.S. Nat. Mus., 92, p. 1060.

Compared with the typical species the wing of this variety is not so extended in the postero-dorsal angle and the posterior border of the wing is not so deeply concave. The general form and sculpture resemble that of *Pterinea honeymani* (Hall), from which it differs in the presence of radiating striæ on the posterior wing.

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[1] Proc. U.S. Nat. Mus., vol. 45, 1913, pp. 334-335.

Length 16 mm., height 15 mm.

Horizon and Locality. Very rare in zone d of the Ross Brook formation, coast section, and also found on Doctor brook, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 452b; paratype, Cat. No. 452a.

Pterinea prominiradiata n.sp.

(*prominens*, prominent; *radius*, radius)
Plate XIV, figures 7, 8, 11

This species differs from *Pterinea emacerata* var. *arisaigensis* n. var., by having a radially striate, as well as a concentrically striate, right valve. The body of the left valve is more slender and more acuminate at the umbo, the radiating striæ are much stronger and more closely and less evenly spaced. The posterior wing is more definitely differentiated from the body of the shell and its posterior border more deeply emarginate, and it is shorter.

Length 22 mm., height 22 mm.

Horizon and Locality. Very rare in zone c of the McAdam formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 5618: Peabody Museum of Yale University; paratype, Cat. No. 452d.

Pterinea antigonishensis n.sp.

Plate XIV, figure 6

A small shell of which the left valve is preserved. Body of shell wide, rather depressed. Posterior wing well demarcated from the body of the shell, a little longer than high, emarginate behind. Surface covered with fine radiating striæ, which are also present on the wing. Concentric striation not so strong as radiate striation. Anterior ear, right valve, and interior of left valve not known.

Length 25 mm., height 20 mm.

Horizon and Locality. Very rare in zone b of the McAdam formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 452c.

Pterinea honeymani (Hall)

Plate XIV, figure 9; Plate XV, figure 5; Plate XVII, figure 3

1860. *Avicula honeymani* Hall, Can. Nat. Geol., 5, p. 153, Fig. 13.
1868. *Avicula honeymani* Dawson, Acad. Geol., 2d. ed., p. 604, Fig. 210.
1892. *Pterinea honeymani* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 190.
1915. *Pterinea honeymani* Bassler, Bull. U.S. Nat. Mus., 92, p. 1060.

Original Description. "Left valve; body of the shell obliquely ovate, convex and somewhat gibbous towards the umbo, anterior wing small, rounded, posterior wing large, triangular, obtuse at the extremity, extending two-thirds the length of the shell. The line between the wing and body of the shell well defined by a slight, abrupt depression along the junction. Surface marked by rounded radiating striæ which are interrupted by fainter concentric undulations or lines of growth; the wing is marked only by concentric striæ.

"This species bears some resemblance to *A. emacerata* of the Niagara and Clinton groups of New York; but its form is slightly more oblique, and the wing is marked only by concentric striæ, while in the New York species the radiating lines on this part are stronger than the concentric ones."

The right valve is less convex and has a lower beak; it is ornamented with concentric striæ only.

In *Actinopteria fornicata* H. S. Williams, the body of the shell is not so slender, not so strongly convex, and the posterior wing is pointed. As the interior of our shell is not known and that of *A. fornicata* not described it cannot be determined if they are congeneric.

Length 17-32 mm., height 15-30 mm.

Horizon and Locality. Very rare in zone a, common in zone b, and very common in zone c of the Stonehouse formation, coast section, and common in zone d of the Stonehouse formation, Stonehouse Brook section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 3111d, 5615, 5617.

Pterinea cancellata (Hall)
Plate XIV, figure 12

1860. *Megambonia* (?) *cancellata* Hall, Can. Nat. Geol., 5, p. 153, Fig. 12.
1868. *Megambonia* (?) *cancellata* Dawson, Acad. Geol., 2d. ed., p. 603, Fig. 209.
1892. *Megambonia cancellata* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Megambonia cancellata* Bassler, Bull. U.S. Nat. Mus., 92, p. 794.

Original Description. "Shell sub-ovate, widening posteriorly; beak anterior incurved, umbo gibbous, with a gibbous umbonal slope on the posterior side, which is scarcely diverging from the cardinal line; posterior extremity rounded, the basal margin arcuate, with a slight impression anterior to the middle, the anterior end a little gibbous. Surface cancellated by concentric and radiating elevated striæ.

"It is not possible from the specimen before me to refer this species satisfactorily to any known genus."

The specimen figured by Hall must have had the posterior wing, which is similar to that of *P. honeymani* (Hall), embedded in the rock matrix. It differs from *P. honeymani* in the broader, stouter body of the valve and the sculpture of concentric and radiating striæ which lay off little squares instead of oblongs. The anterior wing is comparatively large and demarcated by a sulcus, in front of which there is a low fold.

Length 19 mm., height 14 mm.

Horizon and Locality. Very rare in zone a, rare in zone b, and common in zone c of the Stonehouse formation, coast section, and rare in zone d of the Stonehouse, Stonehouse Brook section, Arisaig, N.S.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 5616.

Pterinea twenhofeli n.sp.
Plate XIV, figure 10

A large species, of which the left valve is preserved. Higher than long, somewhat oblique, fairly convex. Anterior ear well demarcated from the body of the shell. Posterior wing not preserved. Surface covered with low radiating striæ, moderately coarse, and closely arranged; not preserved on anterior ear. There are also concentric wrinkles of growth. This species is named for Professor W. H. Twenhofel of Wisconsin University.

Length 45 mm., height 53 mm.

Horizon and Locality. Very rare and probably from zone b of the Stonehouse, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 6036.

Pterinea marklandensis n.sp.
(*Markland,* Nova Scotia in Scandinavian mythology)
Plate XVI, figure 10

A large, depressed and oblique species, of which the left valve is preserved. Body of shell inclined about 45 degrees to the hinge-line, convex, narrowing toward the umbo, and widening and flattening posteroventrally. Posterior wing much longer than high, well demarcated from the body of the shell. Anterior ear not preserved. Surface covered with radiating, low, closely set, moderately coarse striæ, much as in *Pterinea twenhofeli* n.sp. Concentric growth lines rather strong.

This species differs principally from *P. twenhofeli* in the less convexity, somewhat greater obliquity, and greater width of the body of the valve.

Length 45 mm., height 36 mm.

Horizon and Locality. Very rare and probably from the Stonehouse formation, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 6037.

Pterinea amii n.sp.
Plate XVII, figure 5

A fair-sized, oblique, and radially ribbed species. The left valve only is known and of this the body of the shell and the posterior wing are preserved. Body of shell convex, the axis forms an angle of about 45 degrees with the hinge-line; submargin or upper border straight and narrowly impressed; rounded below and anteriorly. Posterior wing longer than high, but total length not known. Surface of body and wing covered with radiating costæ, separated by wide interspaces, which are crossed by concentric low ridges, irregularly spaced; 13 costæ on the body of the valve and 3 on the posterior wing.

The species is named for H. M. Ami of the Geological Survey.

Length 34 mm., height 43 mm.

Horizon and Locality. Very rare, horizon not known, but probably from the Stonehouse formation, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 6039.

Pterinea northumberlandensis n.sp.

Plate XVII, figure 7

A species of fair size, of which the body and posterior wing are preserved. Body of shell convex, oblique, but not so much so as in *Pterinea amii* n.sp. Submargin or upper margin slightly curved and slightly impressed, rounded below and anteriorly; surface covered with low, radiating, moderate costæ, which are separated by fairly wide interspaces and crossed by irregular, indistinct, concentric ridges. Posterior wing triangular, about as long as high; concentric striæ distinct, fine radiating costæ hardly perceptible. Anterior ear not preserved.

Length 35 mm., height 43 mm.

Horizon and Locality. Very rare and probably in the Stonehouse formation, coast section, Arisaig, N.S., but horizon not known.

Type. Peabody Museum of Yale University; holotype, Cat. No. 488.

Pterinea gesneri n.sp.

Plate XVII, figure 4

A large, depressed, rounded species of which the right valve is preserved. Body of valve rounded, lowly and evenly convex; umbo turned forward; surface covered with radiating, curved, low, rounded, and coarse striæ, closely spaced. Posterior wing long, narrow, and has coarse, irregular lines curving away from the hinge-line; the mould shows two narrow grooves along the hinge-margin. The species is named for Abraham Gesner, author of "Geology and Mineralogy of Nova Scotia."

Length 75 mm., height 53 mm.

Horizon and Locality. Very rare, horizon not known, but probably from the Stonehouse formation, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 6038.

Pterinea stonehousensis n.sp.

Plate XVI, figure 11; Plate XVII, figures 2, 6

A large, depressed species; left valve lowly convex and the surface is rather irregular; beak small, turned forward; posterior wing large, subtriangular, but not very well demarcated from the body of the valve; anterior ear, small, not well preserved; surface covered with fine, wavy, irregular, closely set costæ, finest on umbo and wings, coarsest ventrally. Right valve concave; beak turned forward, smaller than in left valve; large posterior wing poorly set off from the body of the valve; small anterior ear; surface covered with fine radiating costæ, which are not so distinct as on the left valve. Following measurements are of imperfect specimens, but give some idea of size and outline of this species.

Length 38 mm., height 47 mm.
Length 45 mm., height 63 mm.

Horizon and Locality. Very rare in zone b and very rare in zone c of the Stonehouse, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 455: paratype, Cat. No. 455a: Victoria Memorial Museum; paratype, Cat. No. 6041.

Genus, *Leptodesma* Hall

1883. *Leptodesma* Hall, Pal. N.Y., 5, pt. 1, Lam. (adv. copy), p. 4.
1884. *Leptodesma* Hall, Pal. N.Y., 5, pt. 1, Lam. 1, pp. XIII, 175.
1913. *Leptodesma* Dall, Zittel-Eastman Textb. Pal., p. 444.

Aviculoid-pterineoid, inequivalve, shells, ornamented with concentric striæ. Dimyarian. Slender lateral tooth. Ligament external. Placed by Dall in family Pterineidae Dall. Imperfect specimens may be confused with *Leiopteria* which Dall puts in the family *Pteriidae* Meek, together with *Actinopteria* and other monomyarian genera. The interiors of the shells described below are not known. They are placed provisionally under *Leptodesma*. Genotype, *Leptodesma potens* Hall.

Leptodesma subrhomboidea n.sp.
(*sub*, near to; *rhomboidea*, a species name)
Plate XIV, figures 1, 2

This species, although closely related to *Leptodesma rhomboidea* (Hall)[1] differs from it in the lesser proportional height. The hinge-line is straight and the anterior end flattened but not auriculate. Posterior wing is moderately well defined, has its posterior border slightly concave above, and is not extended in the postero-dorsal angle. Surface covered with concentric, somewhat distant, raised striæ. Right valve not well preserved but apparently similar to the left.

Length 13 mm., height 13 mm.
Length 21 mm., height 20 mm.

Horizon and Locality. Common in zone d of the Ross Brook formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; paratype, Cat. No. 5619: Peabody Museum of Yale University; holotype, Cat. No. 452.

Leptodesma acadiensis n.sp.
Plate XIV, figure 5

A species of fair size. Body of valve convex, inclined about 45 degrees to the hinge-line; straight and steeply inflected along the submargin, rounded ventrally and anteriorly. Posterior wing longer than high; emarginate below. Anterior ear small. Surface covered with coarse concentric folds. Right valve not known.

Length 36 mm., height 27 mm.

Horizon and Locality. Very rare in zone b of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 486.

Genus, *Palaeopecten* H. S. Williams

1913. *Palaeopecten* H. S. Williams, Proc. U.S. Nat. Mus., 45, p. 331.

Inequivalve, inequilateral shells; posterior ear larger than the anterior. Ligamental area of hinge has fine longitudinal lines. Triangular cartilage pit in left valve. Strong diverging ridges. Radiating ridges on left valve. Genotype, *Palaeopecten cobscooki* H. S. Williams.

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[1] Pal. N.Y., 2, 1852, p. 84, Pl. 27, figs. 2a-d.

Palaeopecten danbyi (McCoy)
Plate XV, figure 7

1851. *Avicula ? danbyi* McCoy, Ann. Mag. Nat. Hist., ser. 2, 7, p. 59.
1855. *Avicula danbyi McCoy,* Brit. Pal. Foss., p. 258, Pl. 11, figs. 11 and 13.
1913. *Palaeopecten danbyi* H. S. Williams, Proc. U.S. Nat. Mus., 45, p. 332.

Original Description. "Obliquely ovate, anterior end broadly rounded, posterior end more or less narrowed, rounded, ventral margin evenly convex; hinge-line rather less than half the width of the shell, posterior wing scarcely twice the length of the anterior, both wings nearly rectangular with slightly concave margins; left valve gently convex, most gibbous near the beaks, marked with minute concentric, irregular, interrupted striæ and wrinkles, crossed by a variable number of obtuse ridges radiating from the beak, and generally becoming obsolete towards the margin; right valve flat, with slight irregular concentric wrinkles and striæ of growth, without radiating ridges."

Only three specimens of the left valve are preserved. They agree with *Palaeopecten danbyi* (McCoy) as restricted by H. S. Williams.

Length 67 mm., height 47 mm.

Horizon and Locality. Very rare and probably from zone d of the Stonehouse formation, coast section, Arisaig, N.S. Also found in the Edmunds and Pembroke formations, Eastport, Maine, and in the Upper Ludlow of Westmoreland, England.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 5620.

Genus, *Pteronitella* Billings

1874. *Pteronitella* Billings, Geol. Surv., Can., Pal. Foss., 2, pt. 1, p. 141.

Equivalve to somewhat inequivalve Aviculids, umbo nearly terminal and the surface anterior and posterior thereto flattened; anterior wing more or less well defined. Several cardinal teeth below and anterior to beak; they are inclined posteriorly; one or two elongated teeth posterior to the beak. Anterior muscle scar strongly impressed and the posterior less so. Being dimyarian is allied to *Pterinea.* Genotype, *Pteronitella venusta* Billings.

Pteronitella venusta Billings
Plate XV, figures 1, 3, 4

1874. *Pteronitella venusta* Billings, Geol. Surv., Can., Pal. Foss., 2, pt. 1, p. 142, Pl. 9, figs. 5, 5a.
1892. *Pteronitella venusta* Ami, Trans. N.S. Inst. Sc., ser. 2, 1, p. 190.
1915. *Pteronitella venusta* Bassler, Bull. U.S. Nat. Mus., 92, p. 1064.

Original Description. "Hinge-line straight, extending a short distance in front of the beak, and, behind the umbones, backwards to about the posterior extremity of the body of the shell. Anterior extremity, in the upper fourth part of the height, forming a small triangular projection in front of the beaks; the lower three-fourths sloping downwards and gradually curving backwards, into the ventral margin. The latter is uniformly rounded, the greatest depth being about the mid-length or a little behind. The most projecting point of the posterior extremity of the body of the shell is a little below the mid-height. Below this point the outline curves downwards and forwards, passing gradually into the ventral margin. Above the same point there is a curve, at first forwards, and then backwards, to the posterior extremity of the hinge-line, the sinus thus formed being at about three-fourths the height of the shell.

"The right valve is nearly flat; the left is moderately and obliquely convex from the umbones to the lower half of the posterior extremity. The posterior wing is either flat, gently concave, or very slightly convex. The anterior wing is flat for a small space at its extremity; behind this, slightly convex, and then with an obscure depression running from the beak, downwards and sloping slightly backwards, for one-half the height of the shell or a little more. The beak of the right valve is situated at about the anterior fifth.

"The best preserved impression of the hinge-line shows four anterior teeth. The first of these slopes downwards and forwards; the other three downwards and backwards. There appear to be two lateral teeth in the right valve and one in the left. They are about one-fourth the length of the shell, and situated in the middle part, close to the hinge-line.

"Surface concentrically striated. On the anterior wing the striæ are lamellose, and closely crowded together. On the body of the shell . . the striæ are for the greater part fine, simple, sharply elevated ridges, about one line distant from each other, and with nearly flat spaces between. The surface of the smaller specimens is more closely striated. On the posterior half of the shell, the striæ, above the mid-height, curve forwards, and then backwards and upwards to the hinge-line, thus forming a rounded sinus with the convexity toward the umbones . . .

"In *P. retroflexa* (Hisinger) the hinge-line is considerably longer than the body of the shell, while the anterior wing is not acutely pointed, as in this species, but truncated at nearly a right angle."

In some specimens, the hinge-line does not by any means extend to the posterior extremity. By the straightening of the basal margin and the steepening of the anterior margin this species passes into var. *oblonga* (Billings).

Length 58 mm., height 35 mm.

Horizon and Locality. Very rare in zone a, rare in zone b, common in zone c, and rare in zone d, Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; cotype, Cat. No. 3133; plesiotypes, Cat. Nos. 5621, 5622.

Pteronitella venusta var. *oblonga* (Billings)
Plate XVI, figures 3, 5, 7, 8

1874. *Pteronitella oblonga* Billings, Geol. Surv., Can., Pal. Foss., 2, pt. 1, p. 143, Pl. 9, fig. 7.
1915. *Pteronitella oblonga* Bassler, Bull. U.S. Nat. Mus., 92, p. 1064.

Compared with the species, this variety has an almost straight basal margin and the anterior margin is more steeply inclined, at right angles, to the hinge and basal margins. The hinge-margin extends to the posterior extremity or a little beyond. As in the species, the surface is concentrically ornamented with lamellose coarse striations. It is this variety that comes nearest to *Pterinea retroflexa* (Wahlenberg) as identified by McCoy.

In zone b of the McAdam there are a few specimens which are thought to be of this species, but they are not well preserved (*See* Plate XVI, figures 3, 8). The fine radial striation is preserved on the surface of one of the specimens.

Length 70 mm., height 50 mm.
Length 57 mm., height 35 mm.

Horizon and Locality. Very rare in zone b of the McAdam, rare in zone a of the Moydart, very rare in zone b and rare in zones c and d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Type. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5623, 5624: Peabody Museum of Yale University; plesiotypes, Cat. Nos. 453a, 453b.

Pteronitella curta Billings
Plate XV, figure 2; Plate XXVIII, figure 8

1874. *Pteronitella curta* Billings, Geol. Surv., Can., Pal. Foss., 2, pt. 1, p. 143, Pl. 9, fig. 6.
1880. *Pteronitella curta* Dawson, Can. Nat., N.S., 9, p. 343.
1892. *Pteronitella curta* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 190.
1915. *Pteronitella curta* Bassler, Bull. U.S. Nat. Mus., 92, p. 1063.

Original Description. "Length on the hinge-line from one-eighth to one-sixth greater than the height. Dorsal margin straight, equal to the greatest length or a little more. Beaks about the anterior fourth. Anterior margin descending nearly vertically from the hinge-line, nearly straight or slightly concave in the upper third; very gently convex in the middle and broadly below into the ventral margin. The latter is gently and uniformly convex in the middle, and broadly rounded upwards at each end. The posterior extremity is nearly at a right angle to the hinge-line in the upper half, straight or slightly concave. In the lower half it is obtusely rounded into the ventral margin. In one specimen, the lower half projects two or three lines farther back than the end of the hinge-line.

"The right valve is moderately convex, depressed, concave, flat, or very slightly concave, below the posterior half of the hinge.

"One specimen shows the impressions of three lateral teeth close beneath the hinge in the middle third. Another exhibits four small anterior teeth.

"Surface concentrically striated, four or five in two lines, closer and sub-lamellose on the small anterior wing."

This is a shortened form of *Pteronitella venusta* Billings, but there is little intergradation of length in the specimens examined by the writer. The basal margin varies from nearly straight to moderately arched and the anterior margin from normal to the hinge-margin to less steeply inclined. As in *P. venusta,* the left valve is more convex than the right. *Avicula rectangularis* Sowerby from the Upper Ludlow, and probably congeneric, is higher and has the anterior margin lobed above.

Length 63 mm., height 62 mm.
Length 45 mm., height 40 mm.

Horizon and Locality. Rare in zone a of the Moydart, very rare in zone a, rare in zone b, common in zone c, and rare in zone d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 3135a; plesiotype, Cat. No. 5625.

Pteronitella altiformis n.sp.
(*altus*, high)
Plate XV, figure 6

A much higher species proportionately than *Pteronitella curta* Billings; about twice as high as long. The anterior and posterior margins are nearly parallel, but not quite normal to the dorsal margin. Surface sculpture not known. Position of umbo, dentition, etc., as in other species of this genus.

Horizon and Locality. Very rare in zone a of the Moydart, very rare in zones b and c and rare in zone d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5626.

Pteronitella compressiformis n.sp.
(*compressus*, compressed)
Plate XV, figure 8; Plate XVIII, figure 16

It is much higher than long. The hinge-line is long and straight, the postero-dorsal angle is abrupt and very little rounded. The posterior border is straight and inclined. Ventral and anterior borders are rounded. Right valve more depressed than in *P. altiformis;* the convexity is very little. Surface not preserved. In the paratype the dentition is obscurely preserved at the beak; there are several fine, backward-directed cardinal teeth; holotype poorly preserved, but has traces of lateral teeth.

Length 25 mm., height 30 mm.

Horizon and Locality. Very rare in zone e of the Ross Brook formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 453; paratype, Cat. No. 453c.

Pteronitella (?) *beechhillensis* n.sp.
Plate XVI, figure 2

Higher than long, a little oblique. Rather evenly convex, most so just below the umbo, inflected along upper anterior margin. Beak small; anterior and hinge-margins straight; ventral margin rounded, ascending anteriorly; posterior margin not preserved. Under the beak, about 8 small transverse teeth. In front of the beak are two teeth, and a faint third, inclined forward. Posteriorly there are three fairly strong and long lateral teeth.

The outline recalls *Pteronitella altiformis* n.sp. and *P. compressiformis* n.sp. The dentition, however, is different and it is not a true *Pteronitella.*

A specimen of a right valve (Plate XVI, figure 1) is probably congeneric, but the coarser transverse teeth below the beak show that it is not of the same species. A third specimen, poorly preserved, is very similar (Plate XVI, figure 9).

Length 20 mm., height 23 mm.

Horizon and Locality. Very rare in the Beechhill formation, Rory McDonald brook, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 6213.

Family, AMBONYCHIIDAE Miller
Genus, *Mytilarca* Hall

1869. *Mytilarca* Hall, Prel. Notice Lam., pt. 2, dec., 1869, p. 19.
1913. *Mytilarca* Dall, Zittel-Eastman Textb. Pal., 2d. ed., p. 445.
Genotype, *Inoceramus chemungensis* Conrad.

Mytilarca amii n. sp.
Plate XX, figure 16

A species of fair size, fairly convex, higher than long[1] and mytiliform in outline. Anterior margin almost straight, but somewhat concave above; ventral and posterior margins rounded; beak small, anterior; shell evenly convex, except near the anterior margin where it is abruptly and deeply inflected; surface has coarse, irregular growth lines.

Length 25 mm., height 38 mm.

Horizon and Locality. Very rare in zone a of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 461a.

Mytilarca sp.
Plate XX, figure 15

This is a smaller and more convex species than *Mytilarca amii* n.sp. It has a more pronounced umbo and is not so deeply or abruptly inflected along the anterior margin.

Horizon and Locality. Very rare and probably from the Stonehouse.

Type. Peabody Museum of Yale University; Cat. No. 478.

Genus, *Palaeocardia* Hall

1867. *Palaeocardia* Hall, 20th Ann. Rept. N.Y. State Cab. Nat. Hist., p. 341.
1913. *Palaeocardia* Dall, Zittel-Eastman Textb. Pal., 2d. ed., p. 445.
Genotype, *Palaeocardia cordiformis* Hall.

Palaeocardia ? *woodmani* n.sp.
Plate XX, figure 12

The hinge-line and muscle scars are not preserved. The specimen here described is probably of the right valve. Of medium size, gibbose, higher than long. Anterior and basal borders evenly rounded; posterior border almost straight; hinge-line not preserved. Shell very convex;

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[1] The hinge-line is not preserved. For the purpose of description the shell is oriented like those of *Mytilarca* on Plate 22 of Pal. N.Y., vol. 5, pt. 1, Lam. 1. This is not the orientation of the descriptions in Hall's text.

post-umbonal slope abruptly rounded and surface deeply inflected posterior to it; umbo and beak prominent, beak incurved. Surface covered with numerous fine radiating costæ.

This species is named for Dr. J. E. Woodman, investigator of Acadian geology.

Length 15 mm., height 28 mm.

Horizon and Locality. Very rare and probably from the Moydart formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 6030.

Family, MODIOLOPSIDAE Fischer

Genus, *Modiolopsis* Hall

1847. *Modiolopsis* Hall, Pal. N.Y., 1, p. 157.
1897. *Modiolopsis* Ulrich, Geol. Minn., 3, pt. 2, p. 502.
1913. *Modiolopsis* Dall, Zittel-Eastman Textb. Pal., 2d ed., p. 462.

Elongate, subovate, posteriorly expanding shells; beaks nearly anterior; hinge edentulous; pallial line simple; anterior adductor more strongly impressed than the posterior. The lack of an oblique fold or tooth in the left valve distinguishes it from *Modiomorpha* Hall. Surface has concentric striæ. Genotype, *Pterinea modiolaris* Conrad.

Modiolopsis haliburtoni n.sp.

Plate XVIII, figure 12

This species has the dorsal and ventral margins nearly parallel. The posterior margin is rounded and truncate above, the umbonal slope is rounded and somewhat inflected above. The surface is covered with somewhat wrinkled concentric undulations. A narrow, shallow sulcus on the post-umbonal slope extends from the umbo to the postero-basal angle and is bounded in most specimens on either side by a ridge. Incipient nodes are formed where the concentric ridges meet the radiating ones on either side of the sulcus. There is some variation in elongation, a few specimens being nearly quadrate. The position of the beaks varies a little, but is generally within the anterior one-fifth.

Compared with *M. exilis* Billings the dorsal and ventral margins are more nearly parallel and the concentric undulations are anteriorly sharper and more closely arranged. *M. exilis* lacks the radiating sulcus and ridges.

Length 18 mm., height 8 mm.
Length 19 mm., height 8 mm.
Length 15 mm., height 7 mm.
Length 12 mm., height 9 mm.

Horizon and Locality. Very common in zone c of the McAdam, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 457.

Modiolopsis exilis Billings

Plate XVIII, figures 14, 15, 17; Plate XIX, figure 16

1874. *Modiolopsis exilis* Billings, Geol. Surv., Can., Pal. Foss., 2, pt. 1, p. 132, Pl. 8, figs. 5, 5a.
1874. *Modiolopsis ruda* Billings, Geol. Surv., Can., Pal. Foss., 2, pt. 1, p. 133, Pl. 8, fig. 6.
1892. *Modiolopsis exilis* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 190.
1915. *Modiolopsis exilis* Bassler, Bull. U.S. Nat. Mus., 92, p. 814.
1915. *Modiolopsis ruda* Bassler, Bull. U.S. Nat. Mus., 92, p. 819.

Original Description. "Shell transverse, sub-ovate; slightly arcuate; length a little more than twice the height; hinge-line nearly straight, slightly convex, extending backwards to about the posterior third of the length of the shell; ventral margin in some specimens gently concave, in others in the anterior half and slightly convex behind; curved upwards at each extremity. Beaks situated at about the anterior fourth, closely incurved. Anterior extremity about half the height of the shell, uniformly rounded below, apparently narrowly rounded or subangular above. Posterior margin obliquely sloping from the end of the hinge-line downwards to about the mid-height of the shell, below this sub-truncate or broadly rounded. From the umbones, an obtusely rounded angulation extends to the lower posterior angle; above this the shell has a flat, gently convex or gently concave slope to the hinge-line and posterior margin. Below and in front of the angulation the sides of the shell are gently convex, or partly concave and partly convex.

"Surface with strong concentric ridges, four to six in two lines, at the anterior end. On the sides and at the posterior extremity the ridges are finer but accompanied by more or less strongly impressed concentric grooves or interruptions of growth."

In recognizing two independent species among the forms which are here grouped under a single species, Billings failed to consider the almost infinite variation which they undergo. An examination of his descriptions and figures shows that *Modiolopsis ruda* Billings was differentiated on the basis of the terminal position of the beak and "in one of the specimens . . . an obscure elevated line running from the umbones downward to the ventral margin." The variation in the position of the beak is too great and not sufficiently co-ordinate with variation in other characters, as development of the "obscure elevated line," proportionate length, conspicuousness of the umbo, and size, to warrant even the segregation of a variety, much less the separation of a species. The nearest approach to a definite variety is that of some large shells having rather depressed umbones. The position of the beaks varies from one-fourth the distance from the anterior extremity to nearly terminal and this variation is not co-ordinate with that in size or proportionate length. The outline varies from, length three times the height, to almost quadrate. There is also considerable variation in size. The concentric ridges are more prominent on the anterior surface than on the posterior part.

Modiolopsis solenoides (Sowerby) from the English and Welsh Upper Ludlow has the dorsal and ventral margins more closely parallel. *M. leightoni* H. S. Williams from the Pembroke formation, Maine, is a closely related species which probably overlaps the Arisaig species in its variations. It is in no specimens so elongate as Billings' species, however. *M. leightoni* var. *quadrata* H. S. Williams from the Pembroke formation, Maine, is practically the same as the subquadrate forms of Billings' species. All the Pembroke specimens, both species and variety, are smaller than those of the Stonehouse formation.

Length 37 mm., height 18 mm.
Length 34 mm., height 11 mm.
Length 22 mm., height 16 mm.

Horizon and Locality. Rare in zone b, very common in zone c, and common in zone d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; cotypes, Cat. Nos. 3099, 3099a; plesiotype, Cat. No. 5634: Peabody Museum of Yale University; plesiotype, Cat. No. 489.

Modiolopsis rhomboidea Hall
Plate XIX, figure 4

1860. *Modiolopsis ? rhomboidea* Hall, Can. Nat. Geol., 5, p. 148, Fig. 6.
1868. *Modiolopsis ? rhomboidea* Dawson, Acad. Geology, 2d. ed., p. 599, Fig. 203.
1892. *Modiolopsis rhomboidea* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 190.
1915. *Modiolopsis rhomboidea* Bassler, Bull. U.S. Nat. Mus., 92, p. 819.

Original Description. "Shell sub-rhomboid, rounded in front, wider and obliquely truncate behind, hinge-line slightly ascending from the anterior end; beaks subterminal, posterior umbonal slope obtusely subangular below, anterior to which the shell is flattened; basal margin nearly straight, the shell gradually widening behind and the posterior basal extremity abruptly rounded. Surface evenly striated concentrically.

"Anterior muscular impression very strong, posterior muscular impression less strongly defined, but still very conspicuous and sub-duplicate; pallial line simple, nearly parallel to the basal margin, strongly and almost equally defined in all parts of its length between the two muscular imprints.

"This shell bears some resemblance to *M. primigenius*, but is less ventricose in the middle, and the subangular umbonal slope is not so well defined as in that species."

The obliquity of the dorsal and ventral margins and the proportionate length vary considerably. By shortening of the shell along the hinge-line, by divergence of the ventral and dorsal margins and extension in the direction of the posterior margin, this species passes into the var. *eurymyelaformis* n. var. The outline resembles that of *Orthonota prora* (Salter)[1] (=*Orthonota semisulcatus* McCoy), but the Arisaig species lacks the longitudinal wrinkles of the anterior end.

Length 23 mm., height 15 mm.
Length 23 mm., height 11 mm.

Horizon and Locality. Rare in zone b, very common in zone c, and very common in zone d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S. Identified by Foerste in the Brassfield of Ohio.

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[1] Murchison's Siluria, 3rd ed., Foss. (61), Fig. 4.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 5635.

Modiolopsis rhomboidea var. *eurymyellaformis* n.var.
(*Eurymyella*, a generic name)
Plate XIX, figure 7

Compared with the species, this variety is relatively higher and shorter, the ventral and basal margins more diverging, the posterior margin more oblique, the outline is more extended in the direction of the postero-basal angle, and the position of the beak is relatively not so anterior.

Length 20 mm., height 13 mm.
Length 13 mm., height 11 mm.

Horizon and Locality. Very rare in zones c and d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5636.

Modiolopsis rhomboidea var. *subnasuta* (Hall)
Plate XIX, figure 1

1860. *Modiolopsis subnasutus* Hall (not Meek and Worthen 1870), Can. Nat. Geol., 5, p. 148.
1868. *Modiolopsis subnasutus* Dawson, Acad. Geol., 2d. ed., p. 599.
1915. *Modiolopsis subnasuta* Bassler, Bull. U.S. Nat. Mus., 92, p. 820.

Original Description. "Shell elongate sub-spatulate, the length being more than twice the greatest width; hinge-line slightly ascending posteriorly; beaks sub-anterior, the anterior end very narrow, gibbous on the umbones, with a subangular ridge on the umbonal slope which extends to the postero-basal angle; basal margin nearly straight, the posterior end somewhat flattened and obliquely subtruncate at the extremity; surface marked by concentric lines of growth.

"This shell bears a close general resemblance to *M. nasutus* of the Trenton limestone, but a careful comparison shows it to be wider and more abrupt at its posterior termination, while the direction of the striæ of growth is very distinctive, these marks being regularly curving toward the posterior end in *M. nasutus*, while in this species they are abruptly bent at the postero-basal angle, and again on the cardinal side, corresponding with the truncate posterior extremity of the shell."

The typical features of this variety are the "subangular ridge on the umbonal slope" and the sulcus in front of it; the sulcus gives rise to a slight sinuation in the basal margin. In these characters it differs from *Modiolopsis rhomboidea* Hall. Some specimens are relatively short and others are more elongate. The obliquity of the ventral to the dorsal margin varies; both are parallel in some specimens. The elongate specimens resemble *Orthodesma* Hall and Whitfield. The anterior and posterior adductor muscle scars are nearly equal, however, and this does not conform to Ulrich's re-definition of *Orthodesma*. This author states[1] that the "anterior scar [is] large, though scarcely half the size of the posterior."

Length 11 mm., height 8 mm.
Length 17 mm., height 6 mm.
Length 19 mm., height 8 mm.

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[1] Geol. Minn., 3, pt. 2, 1894, p. 516.

Horizon and Locality. Very rare in zones b and c of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 5637.

Modiolopsis rossonia n.sp.

(*Rossonia*, a latinized form of the formation name Ross Brook)

Plate XVI, figures 4, 6

A species of moderate size, oblique and gently convex. It is somewhat extended postero-basally, but in a few specimens less so. The umbo is a little anterior to the centre of the hinge-margin. The surface is covered with fine concentric growth lines.

Length 22 mm., height 19 mm.

Horizon and Locality. Very common in zone d and rare in zone e of the Ross Brook formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 454; paratype, Cat. No. 454a.

Modiolopsis latouri n.sp.

Plate XIX, figure 2

This is a small species of which the exterior of the left valve is preserved. Transverse, depressed, somewhat oblique. Umbo a little in front of the middle, beak rising slightly above the hinge-margin. Postumbonal slope rounded. Hinge-line, long, straight. Posterior margin rounded. Basal margin rounded, ascending anteriorly. Anterior margin rounded. Surface covered with fine concentric striæ. Named for Charles de la Tour, early French colonizer.

Length 13 mm., height 8 mm.

Horizon and Locality. Very rare in zone d of the Ross Brook formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 6034.

Modiolopsis sp.

Plate XIX, figure 3

A small specimen of a right valve is so designated. Transverse, elliptical, depressed. Beak very small, near the anterior end. Hinge-line short; anterior margin short, rounded; basal margin rounded, ascending anteriorly; posterior margin rounded, obliquely truncate above; surface not preserved.

Length 19 mm., height 10 mm.

Horizon and Locality. Very rare in zone d of the Ross Brook formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; Cat. No. 6033.

Genus, *Goniophora* Phillips

1848. *Goniophora* Phillips, Mem. Geol. Surv., Gt. Brit., 2, pt. 1, p. 264.
1885. *Goniophora* Hall, Pal. N.Y., 5, pt. 1, Lam. 2, p. 23.
1910. *Goniophora* Hind, Trans. Roy. Soc. Edin., 47, p. 538.
1913. *Goniophora* Dall, Zittel-Eastman Textb. Pal., 2d. ed., p. 462.

Equivalve, rhomboidal to trapezoidal shells. Umbones anterior and curved inward and forward. A strongly carinate ridge from the umbo to the postero-basal angle. An oblique tooth in the left valve. Anterior adductor deeply impressed, and has a strong radial process behind it. Genotype, *Cypricardia cymbaeformis* Sowerby.

Goniophora consimilis Billings

Plate XVII, figure 1; Plate XVIII, figures 1-3; Plate XXIX, figure 10

1874. *Goniophora consimilis* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 135, Pl. 8, fig. 8.
1915. *Goniophora consimilis* Bassler, Bull. U.S. Nat. Mus., 92, p. 564.

Original Description. "Semi-ovate; length a little more than twice the height; greatest height at about one-third the length from the anterior extremity; beaks nearly terminal, closely incurved, situated at about half the height of the shell. On a side view . . . the outline of the anterior, dorsal, and posterior margins together, constitute an almost continuous semi-ovate curve, most obtuse and uniformly rounded in the anterior half and descending with a gently convex or nearly straight slope from about the mid-length to the lower posterior angle. With the plane of the entire margin of the shell vertical, a small portion of the hinge-line is seen above the ridge, extending back about two-thirds the length; thence the posterior margin descends with a gently convex slope to the lower angle. The umbonal ridge is very prominent; its edge not acute but truncated to the width of half a line or a little more; in one specimen it seems to have a groove running along its whole length. The anterior extremity projects about two lines beyond the beaks. The ventral margin is nearly straight or gently concave, the anterior fifth curving upwards and a small portion at the posterior extremity curving downwards.

"Surface (of the specimen figured) with very fine transverse striæ six to eight in one line, as seen on the anterior extremity. These are separated at intervals of from half to one line, by obscure grooves. At the carina the striæ are coarser, three or four in one line. There are no radiating striæ . . . It is certainly closely related to (*Goniophora cymbaeformis* Sowerby) but still appears to be distinct. The figure in the "Silurian System" Plate 5, figure 6, shows the beaks extending beyond the anterior extremity. Again, Prof. McCoy (Pal. Foss., page 275) says "anterior side very small, scarcely extending as far as the beak." In our species the anterior extremity extends a little beyond the beak. It has also the edge of the carina obtuse and is even slightly grooved."

There is considerable variation in outline, some specimens being much longer than others. The striæ coarsen toward the carina as in *Goniophora mediocris* Billings, but are finer, more numerous, and more irregular than in that species. They are also finer above the carina than below. A slight variation toward *G. mediocris* is shown by some specimens in a coarsening of the striation. Both the McAdam specimens have rather fine striation.

Horizon and Locality. Very rare in zone c of the McAdam and common in zone c of the Stonehouse and rare in zone d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 3125; plesiotypes, Cat. Nos. 5627, 5628.

Goniophora mediocris Billings

Plate XVIII, figures 4, 5; Plate XXIX, figure 13

1874. *Goniophora mediocris* Billings, Geol. Surv., Can., Pal. Foss., 2, pt. 1, p. 137, Pl. 9, fig. 1.

1915. *Goniophora mediocris* Bassler, Bull. U.S. Nat. Mus., 92, p. 564.

Original Description. "Shell transversely elongate; length thrice the height. Ventral margin with the posterior third gently curved upwards; a portion consisting of a little more than the middle third nearly straight or slightly concave; the anterior fourth rounded upwards. The dorsal margin appears to be nearly straight or gently convex and sub-parallel with the ventral margin for about half the length behind the umbones, and then sloping downwards to the posterior angle. Beaks nearly terminal.

"The valves are strongly carinated; the dorsal portion slightly concave between the carina and the hinge-line, becoming somewhat convex on approaching the posterior extremity. Below the carina the sides descend with a convex slope, a very obscure concavity about the middle third. None of the specimens have the anterior extremity perfect, but it seems to project slightly beyond the beaks. The carina, as seen in casts of the anterior, has the edge narrowly rounded or subacute; it is most probably acute where the shell is preserved. Surface with three or four striæ in the width of one line, below the carina; with finer striæ above.

"Length of the specimen figured twenty-four lines; height at the umbones eight lines; depth, at about the mid-length, six lines."

The striæ, as in *Goniophora consimilis* Billings, become stronger at the carinate ridge. Compared with the striæ of that species, however, they are much coarser, more even, and as strongly developed above the carinated ridge as below it. They are also finer toward the basal margin. The two species are not far removed and tend to intergrade. The beak is directed forward. The outline varies, but is in all specimens longer than high.

Length 24 mm., height 12 mm.

Horizon and Locality. Very rare in zone d of the Ross Brook, very rare in zone c of the McAdam, rare in zone c and very rare in zone d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 5629.

Goniophora laticostata n.sp.

(*latus*, broad; *costa*, rib)

Plate XVIII, figure 6

This species is closely related to *Goniophora transiens* Billings and probably ancestral. It resembles that species in the position of the beak, which is not terminal as in *G. consimilis* and *G. mediocris*. It also resembles *G. transiens* in the prominent, sharply raised, concentric striæ, narrower and more crowded anteriorly. Carinate ridge in the post-umbonal slope. It differs from *G. transiens* in the possession of a flat ridge lying in a broad lateral sulcus, and running from the umbo to the middle of the basal margin.

Length 26 mm., height 12 mm.
Length 20 mm., height 17 mm.

Horizon and Locality. Very rare in zones b and c of the McAdam formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 456.

Goniophora transiens Billings

Plate XVIII, figures 7, 8; Plate XXIX, figure 8

1874. *Goniophora transiens* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 134, Pl. 8, fig. 7.
1892. *Goniophora transiens* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Goniophora transiens* Bassler, Bull. U.S. Nat. Mus., 92, p. 564.

Original Description. "Shell transverse, sub-rhomboidal, moderately and irregularly convex, with an acute, gently sigmoid angulation, extending from the beaks backwards to the lower posterior extremity; beaks situated at about the anterior third of the length, closely incurved; ventral margin gently convex, slightly sinuated in the middle; dorsal margin somewhat straight, anterior extremity uniformly rounded, occupying somewhat over two-thirds the whole height; posterior margin obliquely truncated, slightly convex, forming with the dorsal margin an angle of about 135 degrees; the lower posterior angle is acute, nearly on a line with the ventral margin.

"Behind the carina, the surface descends with a flat or gently concave slope, to the posterior and dorsal margins. At the beak, a flattening of the surface (or a slight concavity) commences, and, gradually widening, extends to the ventral margin, occupying rather more than the middle third of the side of the shell. The concavity occurs a little in front of the mid-length. The flattening extends backwards to the carina. The anterior third is moderately convex.

"Surface in the anterior third with rather strong, rounded, concentric ridges, from two to four in the width of two lines. These are rounded on the upper part, but become more acute towards the margin. On the sides of the shell backwards to the carina, the surface is smoother, but still the ridges are obscurely indicated. There is also a set of very fine striæ on and between the ridges. The posterior portion of the shell behind the carina is marked chiefly by the fine striæ. There are also obscure indications of a few radiating striæ, extending from the beaks towards the ventral margin, obliquely backwards.

"Of this species, only two specimens are in our collection. The right valve of one of these is 2 inches in length and nine lines in height (allowing for a small portion concealed in the matrix). Depth of both valves about seven lines. The other specimen . . . $2\frac{1}{2}$ inches in length; height eleven lines; depth about three lines.

"This latter differs from the first, in having the space behind the carina gently convex . . . ."

Compared with *Goniophora consimilis* Billings, the concentric striæ are coarser, more elevated, and more angular. They become stronger anteriorly, not stronger towards the carinate ridge as in *G. consimilis* and in *G. mediocris* Billings. Compared with these two species, the umbo is not so anterior in position, and it does not curve forward.

Length 59 mm., height 27 mm.
Length 42 mm., height 18 mm.
Length 42 mm., height 15 mm.

Horizon and Locality. Rare in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 3122a, 5630.

Goniophora montsi n.sp.

Plate XVIII, figure 9

Only one specimen of this species is known. Although not well preserved, it is sufficiently so to distinguish it from coeval species of the genus. As in *Goniophora transiens* Billings, the beak is somewhat behind the anterior end, i.e. at about one-fourth, and curves only slightly forward. The post-umbonal ridge is sharply angular, and the surface below and in front of it covered with coarse concentric ridges, 8 in 10 mm., and apparently rounded. Surface above the post-umbonal slope not known. The concentric ridges are coarser and more obtuse than in *G. transiens.* This species is named for the Sieur de Monts, early explorer of Acadie.

Length 47 mm., height 25 mm.

Horizon and Locality. Very rare in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 456a.

Genus, *Cosmogoniophora* McLearn

1918. *Cosmogoniophora* McLearn, Am. Jour. Sci., 45, p. 140.

The species grouped under this sub-genus only differ from *Goniophora* Phillips in the possession of radiating striæ. In the Arisaig Silurian it is represented by a single species and a variety, in which the radiating sculpture is well developed. This is also true of the Hamilton species *Goniophora truncata* Hall. In the Hamilton *G. acuta* (Hall) and the Schoharie grit species *G. perangulata* (Hall) the radial striation is finer. Genotype, *Goniophora bellula* Billings.

Cosmogoniophora bellula (Billings)

Plate XVIII, figures 10, 13

1874. *Goniophora bellula* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 136, Pl. 8, fig. 9.
1892. *Goniophora bellula* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Goniophora bellula* Bassler, Bull. U.S. Nat. Mus., 92, p. 564.

Original Description. "Shell trapezoidal, moderately convex; length not quite twice the height; dorsal and ventral margins sub-parallel; anterior end projecting a little beyond the beaks; posterior extremity abruptly truncated, nearly straight, gently convex, forming an angle of about 90 degrees with the ventral margin; curving forwards, upwards, and joining the line at an angle of about 110 degrees. Ventral margin nearly straight, all except the anterior fifth which is curved upwards. The beaks seem to be at about two-thirds the height of the shell, and a little behind the most projecting anterior point. The angulation is moderately developed, rounded when a little worn, when perfect with a sharp elevated rib-like edge.

"The sides of the shell below the carina flattened or gently concave, from near the front backwards; from the beaks downwards moderately convex. Above the carina, with a flat or gently concave slope.

"Surface with five or six transverse striæ, in a width of two lines. These are crossed in the middle two-thirds by more distinct radiating striæ, six to eight in two lines. A small portion of the anterior extremity with only the transverse lines. Above the carina the striæ are finer, the surface when not magnified appearing nearly smooth."

It may be added that not only do the radiating striæ above the carinated ridge become finer, but they entirely disappear along the cardinal border, where only the concentric striæ are present.

This species closely resembles *Goniophora truncata* Hall[1] from the shales of the Hamilton in Onondaga county, New York, but in the Devonian species there are no radiating striæ above the carinated ridge. In *G. perangulata* (Hall)[2] from the Schoharie grit, New York, the radiating striæ are very much finer. *Goniophora phrygia* Barrande[3] from etage E of Bohemia is further removed than the Devonian species mentioned; it is much more ornate, being entirely covered with rather strong, even, radiating striæ.

Length 25 mm., height 15 mm.

Horizon and Locality. Very rare in zone b, and rare in zones c and d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 3124; plesiotype, Cat. No. 5631.

Cosmogoniophora bellula var. *elongata* n.var.
Plate XVIII, figure 11

1874. *Goniophora bellula* Billings (part), Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 137, non 136, non Pl. 8, fig. 9.

Compared with the species, this variety is longer and in the majority of specimens the surface is more convex above the carinate ridge. It is, however, flattened along the cardinal border. It probably includes the elongate specimens referred to by Billings.

Length 35 mm., height 15 mm.
Length 30 mm., height 10 mm.

Horizon and Locality. Very rare in zone b and common in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5632.

Genus, *Orthodesma* Hall and Whitfield

Orthodesma ? sp.
Plate XX, figure 3

A small, moderately convex shell; contracted anteriorly and expanded posteriorly. Posterior border obliquely truncate, and rounded below. Beak near anterior end.

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[1] Pal. N.Y., 5, 1885, pt. 1, Lam. 2, p. 298, Pl. 42, figs. 9, 10; Pl. 44, figs. 1-5.
[2] Pal. N.Y., 5, 1885, pt. 1, Lam. 2, p. 293, Pl. 34, figs. 1-6; Pl. 42, figs. 1, 2.
[3] Syst. Sil. de la Bohême, 6, Pl. 195, figs. V 1-13.

Horizon and Locality. Very rare in zone e of the Ross Brook formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; Cat. No. 459.

Genus, *Orthonota* Conrad

1841. *Orthonota* Conrad, 5th Ann. Rept. N.Y. Geol. Surv., p. 50.
1885. *Orthonota* Hall, Pal. N.Y., 5, pt. 1, Lam. 2, p. XLV.
1913. *Orthonota* Dall, Zittel-Eastman Textb. Pal., 2d. ed., p. 462.

Like *Palaeoneilo* and *Modiolopsis*, the genus *Orthonota*, although well defined in its typical forms, is, in practice, made use of as a convenient name under which to place many species of uncertain generic affinities.

The genus, as typified by *Orthonota undulata* Conrad, may be defined as follows: elongate, equivalve, inequilateral; beaks nearly terminal; post-umbonal slope rounded or angular and one or more folds between it and the cardinal margin; surface has fine concentric striæ and, also, on the post-cardinal slope, strong, concentric undulations; linear fold on the cardinal margin enclosing the ligament.

The species *Orthonota proundulata* n.sp. falls within the typical genus. The surface and ligamental fold on the cardinal margin of *O. arisaigensis* n.sp. place it close to the typical genus and probably close to the ancestral earlier Silurian stock of the genus. It, however, already shows some divergence from the main line of the typical genus, in the slight transgression of the anterior concentric striæ by ridges directed postero-basally. This character becomes more pronounced in the late Silurian, giving rise to *O. venusta* Billings and, with additional ornamentation, to *O. angulifera*. *O. pressiornata* n.sp. is further from the true genus, but it resembles a species placed by Hall and Clarke provisionally under *Orthonota*, i.e. *O. parvula* Hall and Clarke.

Two species of doubtful affinities, *Orthonota incerta* Billings and *O. simulans* Billings, were placed in this genus by Billings and are left there. They are equivalve, elongate, convex shells; beaks anterior; umbonal slope angular; radiating costæ in front of umbonal slope; narrow escutcheon and lunule probably present; ligament and dentition unknown.

Orthonota proundulata n.sp.

(*pro*, before; *undulata*, a species name)
Plate XIX, figure 13

Compare with:

1841. *Orthonota undulata* Conrad, Ann. Rept. Geol. Surv., N.Y., p. 51, Fig. 6.
1885. *Orthonota undulata* Hall, Pal. N.Y., 5, pt. 1, Lam. 2, p. 478, Pl. 78, figs. 37-42.

The Arisaig Silurian specimens differ only from the Hamilton shells in proportionate length, being shorter than the average of the species. Otherwise the form and sculpture are similar. On the anterior surface of the shell, the concentric ridges are stronger, and become weaker towards the narrow furrow which runs from the umbo to the postero-basal angle. Above this are two flat radiating folds separated by a third and narrower fold, all crossed by strong concentric ridges. These ridges are more numerous on the lowest radiating fold, where additional ridges alternate with those continuing across the upper two folds. Only two specimens are known.

Length 50 mm., height 15 mm.
Length 55 mm., height 19 mm.

Horizon and Locality. Very rare and probably from the Upper Stonehouse, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5640.

Orthonota arisaigensis n.sp.
Plate XIX, figures 6, 8, 9

Compared with *Orthonota rigida* (Sowerby) from the Wenlock and Ludlow of England this species has a similar elongate outline. The anterior surface has prominent concentric raised ridges, which become weaker posteriorly. A prominent ridge runs from the umbo to the posterobasal angle and above it are three, low, radiating folds, separated by furrows and crossed by concentric furrows. The radiating folds, furrows, and cross furrows and ridges are more prominent than in *O. rigida*, and more like those of *O. angulifera* (McCoy). It differs from the latter in that the ridges on the anterior surface trangress the growth lines very little and there are no ridges meeting them at an acute angle. Compared with *O. venusta* Billings, the ridges on the anterior surface do not slope down and die out towards the ventral margin. This species probably belongs to near the main stock of the genus that later diverged and gave rise to *O. venusta* and *O. angulifera* on the one hand and *O. undulata*, *O. proundulata*, and *O. carinata* on the other.

Length 22 mm., height 5 mm.
Length 28 mm., height 7 mm.

Horizon and Locality. Very rare in zone b and rare in zone c of the McAdam formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 5639; paratype, Cat. No. 5638: Peabody Museum of Yale University; paratype Cat. No. 458a.

Orthonota venusta Billings
Plate XIX, figure 11

1874. *Orthonota venusta* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 129, Pl. 8, fig. 1.
1915. *Orthonota venusta* Bassler, Bull. U.S. Nat. Mus., 92, p. 923.

Original Description. "Shell transversely elongate; length about four times the height; dorsal and ventral margins nearly parallel, slightly diverging posteriorly; beaks situated at about the anterior fourth of the length. Behind the umbones the hinge-line is straight, and extends nearly the whole length of the shell. In front of the umbones it is also straight, but at a somewhat lower level than behind. The anterior extremity is nearly vertically truncated for a short distance below the hinge-line, then rounded into the ventral margin; the latter appears to be slightly convex. The posterior extremity is not well preserved in any of the specimens examined, but appears to be nearly vertically truncated in the upper two-thirds, and rounded below. The valves are moderately convex; an obscure rounded angulation extends from the umbones backwards and downwards to the lower posterior angle. Above this the shell is compressed, or even gently concave. A similar rounded angulation runs from the umbones to the lower posterior angle. Above this the shell is compressed, or even gently concave. A similar rounded angulation runs from the umbones to the lower anterior angle.

"The surface, at the anterior extremity, exhibits usually eight or nine narrow but strongly elevated ridges. Before the beaks these descend, nearly vertically from the hinge-line, to the anterior umbonal slope, over which they bend with a narrowly rounded curve, and then slope backwards and downwards in straight parallel lines towards the ventral margin. Three or four of the most anterior ridges seem to die out on reaching the margin. The others become parallel to the margin for a short distance, and then turn upwards to the dorsal margin. Above the posterior umbonal ridge, there are three or four shallow grooves, which originate in a point near the umbones, and gradually radiate backwards to the upper half of the posterior extremity. The concentric ridges are more acute and strongly elevated on the anterior than they are on the posterior part of the shell.

"Length of the best specimen collected, twenty-three lines. Height at the umbones, five and a half lines.

"None of our specimens are perfect, and all have the outlines more or less concealed in the stone. The posterior extremity seems to be narrowly rounded in the lower third, nearly straight or slightly curved in the upper two-thirds. It seems also to be somewhat broader than the anterior. The surface characters of the posterior two-thirds of the shell are less distinct than they are in the anterior third."

Compared with *Orthonota arisaigensis* n.sp., the size is greater and the transgression of the growth lines by the strong anterior ridges, feebly expressed in *O. arisaigensis*, is here pronounced.

Length 47 mm., height 12 mm.

Horizon and Locality. Very rare and probably from the Stonehouse formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 3118.

Orthonota angulifera (McCoy)
Plate XIX, figure 10

1851. *Sanguinolites anguliferus* McCoy, Ann. Mag. Nat. Hist., ser. 2, 7, p. 56.
1855. *Sanguinolites anguliferus* McCoy, Brit. Pal. Foss., p. 276, Pl. 1 k, figs. 19, 20.
1874. *Orthonota angulifera* ? Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 132, Pl. 8, figs. 13, 13a.
1892. *Sanguinolites anguliferus* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 189.
1915. *Orthonota angulifera* Bassler, Bull. U.S. Nat. Mus., 92, p. 923.

Original Description. "Oblong, length three times the width; beaks small, half the width from the anterior end, which is subquadrate, rounded; posterior end subtruncate, not oblique, scarcely wider than the width of the shell from the beak to the ventral margin; dorsal and ventral margins straight, almost parallel; a strong diagonal ridge runs from the beak to the inferior posterior angle, immediately in front of which is the deepest part of each valve; from the beak to the anterior end is marked by eight or ten, narrow, rounded ridges running obliquely downwards and backwards towards the middle of the ventral margins; a few of them meet at an acute angle, about the middle of the shell, with a few, more nearly vertical ridges proceeding from the great diagonal ridge; most of both sets of ridges go towards the ventral margin; they are separated by flat spaces wider than their own diameter; the posterior slope is divided into three broad, rounded radiations by three shallow impressed lines, crossed by irregular wrinkles parallel with the posterior margin, all the ridges are slightly undulated by the faint plicæ of growth; posterior dorsal lunette very narrow, concave, horizontal (or perpendicular to the plane of the valves)."

Length 32 mm., height 10 mm.

Horizon and Locality. Very rare in zone b and rare in zones c and d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S. According to McCoy, it is found in the Upper Ludlow of Kendal, Westmoreland.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 5641.

Orthonota pressiornata n.sp.
(*pressus*, plain; *ornatus*, adorned)
Plate XIX, figure 5

This species resembles *Orthonota inornata* Phillips in its elongate outline, angular post-umbonal ridge, and fine concentric striæ. It is, however, a little shorter. The beaks are more anterior, within one-sixth, and curve forward somewhat. The posterior margin is more obliquely truncate. A single large specimen and two small ones are known. One of the small ones may be the young of a shorter form, but the shape of the umbo and the striation are the same.

Length 27 mm., height 8 mm.

Horizon and Locality. Very rare in zone c of the McAdam, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 458.

Orthonota incerta Billings
Plate XIX, figure 14

1874. *Orthonota incerta* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 130, Pl. 8, fig. 4 (fig. 2 on explanation of plate).
1892. *Orthonota incerta* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 188.
1915. *Orthonota incerta* Bassler, Bull. U.S. Nat. Mus., 92, p. 923.

Original Description. "Shell transversely elongate, length about three times the height, beaks between one-fourth and one-fifth the whole length, from the anterior extremity. Dorsal margin behind the umbones straight. Ventral margin slightly concave for about two-thirds the length, rounding upwards at each end. The anterior extremity is short, rounded about two-thirds the whole height of the shell. The posterior extremity appears to be obliquely truncated in the upper half, rounded in the lower. The valves are moderately convex. From the umbones, a rounded angulation extends to the lower posterior angle. Above this the surface has an abrupt slope upwards, becoming concave on approaching the dorsal margin. A shallow concavity extends from the umbones to the ventral margin.

"Surface with concentric wrinkles, four or five in the width of two lines on the anterior half, becoming smaller backwards; above the oblique angulation somewhat smooth. From the umbones, backwards and downwards to the ventral margin, there are from four to six rather sharp radiating, elevated lines, with concave grooves between them."

Horizon and Locality. Very rare in zones c and d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 3119.

Orthonota simulans Billings
Plate XIX, figures 12, 15

1874. *Orthonota simulans* Billings, Pal. Foss., Geol. Surv., Can., 2, pt. 1, p. 131, Pl. 8, fig. 2 (fig. 4 on explanation of plate).
1915. *Orthonota simulans* Bassler, Bull. U.S. Nat. Mus., 92, p. 923.

Original Description. "Transversely elongate, length about thrice the height, slightly convex; dorsal and ventral margins parallel; anterior extremity short, the most projecting point at about half the height, thence broadly rounded downwards and backwards to the ventral margin; beaks at about one-fifth the whole length of the shell behind the anterior extremity; dorsal margin straight from the beaks backwards for about three-fifths the whole length; posterior margin in the upper half, sloping at an angle of about 130 degrees with the dorsal; lower half narrowly rounded. On the umbones a flattening of the surface commences, which, gradually widening and becoming slightly concave, extends to the ventral margin. Just behind this, a moderately strong, broadly rounded angulation extends from the umbones backwards and downwards, to the lower posterior angle. The dorsal margin is somewhat strongly compressed.

"Surface with obscure concentric striæ, from four to six in the width of two lines, on the anterior half of the shell. In passing backwards, they curve over the oblique carination, and then run with a slope forward, to the straight portion of the hinge-line. From the beaks six or eight fine thread-like radiating striæ run backwards and downward. They are parallel to and just in front of the carina.

"Length of the specimen described about twenty-six lines; height at the umbones eight and a half lines; depth of the left valve about three lines."

Compared with *Orthonota incerta* Billings this species has more lines radiating from the umbo.

Horizon and Locality. Rare in zones c and d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 3117; plesiotype, Cat. No. 5642.

Family, LUCINIDAE Fleming
Genus, *Paracyclas* Hall

1843. *Paracyclas* Hall, Geol. Surv. N.Y., Rept. 4th district, p. 171.
1885. *Paracyclas* Hall, Pal. N.Y., vol. 5, pt. 1, Lam. 2, p. XXXVIII.

Equivalve and sub-orbicular to sub-elliptical shells covered with concentric striations or ridges. Hinge not well known. Genotype, *Paracyclas elliptica* Hall.

Paracyclas fletcheri n.sp.
Plate XX, figures 4 to 10

This is a very variable species and exhibits variation in both form and surface striation; the umbo is central to almost terminal. The outline varies from longer than high to higher than long. Some specimens show extension in the postero-basal angle. The ornamentation varies from fine to coarse rugose striation.

Length 9 mm., height 11 mm.
Length 12 mm., height 9 mm.

Horizon and Locality. Very rare in zone e of the Ross Brook, very rare in zone c of the McAdam, very rare in zone a of the Moydart, very rare in zone a, rare in zone b, very common in zone c, and rare in zone d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 5644; paratypes, 5643, 5645, 5646: Peabody Museum of Yale University; paratypes, Cat. Nos. 460, 460a, 460b.

Family, SOLENIDAE Leach
Genus, *Palaeosolen* Hall

1885. *Palaeosolen* Hall, Pal. N.Y., vol. 5, pt. 1, Lam. 2, p. XLVI.

Equivalve, elongate, evenly convex shells; subparallel ventral and dorsal margins; beak subanterior; gaping posteriorly; ligament probably internal; surface covered with fine striæ of growth; dentition not known; referred to family Solenidæ on basis of external resemblance to *Solen*.

The first species below, referred to this genus, comes nearest to the above diagnosis; the only known important difference is that the surface ornament anterior to, is different from that posterior to, the post-umbonal slope. The second species differs in the same way, and also is probably less gaping and is less strictly cylindrical than the type of the genus. Genotype, *Orthonota siliquoidea* Hall.

Palaeosolen antigonishensis n.sp.
Plate XX, figure 1

This is an elongate, cylindrical, evenly convex, solenoid shell. The hinge-line and basal margin are long, straight, and subparallel. The anterior and posterior margins are not preserved. Shape of posterior end of shell indicates very considerable gaping. Beak small, inconspicuous, subanterior, Surface anterior to the umbonal slope has fine, concentric growth ridges; surface behind the umbonal slope, aside from a few very faint growth ridges, is almost smooth.

Length 32 mm., height 9 mm.

Horizon and Locality. Very rare in zone c of the McAdam formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 6025.

Palaeosolen amii n.sp.

Plate XX, figure 2

An elongate, depressed shell; hinge-line long and straight; basal margin long, very gently rounded; anterior margin rounded, not well preserved; posterior margin, rounded, very oblique above; surface very gently and evenly convex; flattening toward the posterior end. The last character does not indicate very much gaping. Beak small, subanterior. Anterior to the umbonal slope are well-defined, even, concentric striæ; posterior to it the surface is smooth, except for the presence of one or two low, radiating, folds.

Length 34 mm., height 10 mm.

Horizon and Locality. Very rare in zone c of the McAdam formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 6026.

Class, *GASTROPODA*

Family, SINUITIDAE Bassler

Genus, *Plectonotus* Clarke

1900. *Plectonotus* Clarke, Pal. Faunas of Pará, Brazil, p. 38.

Symmetrically involute and trilobate shells; umbilicus small; the presence of a slit-band probably distinguishes this genus from *Bucanella* Meek. Genotype, *Plectonotus derbyi* Clarke.

Plectonotus trilobatus (Sowerby)

Plate XX, figures 18, 30 to 32

1839. *Bellerophon trilobatus* Sowerby, in Murchison's Sil. Syst., p. 604, Pl. 3, fig. 16.

1855. *Bellerophon trilobatus* McCoy, Brit. Pal. Foss., p. 311.

Original Description. "Convoluted, smooth, three lobed, central lobe largest; inner whorls small, visible; aperture above twice as wide as long; length and breadth four lines."

McCoy's Description. "Globose, umbilicus small, deep; whorls trilobed by two deep spiral furrows, the lateral lobes half the width of the mesial one; very convex, mesial lobe most prominent, slightly flattened; width (of small specimens) three lines, length the same; proportional width of umbilicus 32-100, as compared with the diameter of the shell."

The flattened surface of the mesial lobe carried a broad slit-band (2½ mm. wide as compared with 5½ mm. width of lobe). Growth lines on either side of band sharply deflected backward, forming with the latter an angle of about 50 to 60 degrees. Growth lines on the band transverse and deeply concave. Obscure fine revolving striæ present. There are two specimens in the Stonehouse which may constitute a variety of this species. They are much narrower and more slender than other specimens of the same size.

Horizon and Locality. Very rare in zones b and c of the McAdam and common in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 3138, 5649: Peabody Museum of Yale University; plesiotype, Cat. No. 479.

Family, BUCANIIDAE Ulrich and Schofield
Genus, *Bucania* Hall

Bucania sp.
Plate XX, figures 13, 14

A small, imperfect specimen, a mould of the interior, is thus designated and is figured. The ornamentation and slit-band are unknown.

Horizon and Locality. Very rare from Arisaig, but neither horizon nor exact locality known.

Type. Victoria Memorial Museum; Cat. No. 6216.

Family, BELLEROPHONTIDAE McCoy
Genus, *Bellerophon* Montfort

Bellerophon sp.
Plate XX, figures 28, 29

The mould of the interior of an imperfect specimen. The umbilicus is small and there is an elevated blunt keel.

Horizon and Locality. Very rare in zone c of the Stonehouse, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; Cat. No. 462.

Genus, *Bucanopsis* Ulrich

Bucanopsis sp.
Plate XX, figure 17

This species has a narrow slit-band and small revolving striæ, crossed by weaker lines of growth.

Horizon and Locality. Very rare from Arisaig, but horizon and exact locality not known.

Type. Victoria Memorial Museum; Cat. No. 3140c.

Bucanopsis ? sp.
Plate XX, figure 20

Only the mould of the interior is preserved and both generic and specific characters are obscure.

Horizon and Locality. Very rare from Arisaig, but horizon and locality not known.

Type. Victoria Memorial Museum; Cat. No. 3140.

Family, PLEUROTOMARIIDAE d'Orbigny
Genus, *Goniostropha* Oehlert

1887. *Goniostropha* Oehlert, Bull. Soc. Etud. Sci. Angers, 1887, p. 13.
1902. *Goniostropha* Donald (Miss Jane), Quart. Jour. Geol. Soc., London, 58, p. 321.

Following the interpretation of Donald this genus is made to provisionally include shells that have a moderately tapering spire, a narrow concave band bordered by two prominent keels, growth lines not strongly sweeping backward, and slightly angular whorls. Aperture is not preserved and, therefore, presence or absence of a slit not known. Ulrich and Schofield[1] suggest a different interpretation of *Goniostropha* and would make it a subgenus of *Hormotoma* Salter. Genotype, *Murchisonia bachelieri* Ronault.

Goniostropha aciculata (Hall)
Plate XX, figures 21, 25

1860. *Murchisonia aciculata* Hall, Can. Nat. Geol., 5, p. 154.
1868. *Murchisonia aciculata* Dawson, Acadian Geol., 2d. ed., p. 605.
1915. *Murchisonia aciculata* Bassler, Bull. U.S. Nat. Mus., 92, p. 839.

Original Description. "Shell slender, very gradually tapering, volutions about six or seven, the last ones moderately ventricose, aperture elongate oval or ovate, rounded at the anterior margin, columella plain; volutions marked by a distinct band along the centre, and a sub-sutural carina marking the upper side of the volutions; surface striated."

The shell tapers from 8 to 2 mm. in 23 mm. and includes in this height six whorls. Sutures slope considerably. Band bordered by two prominent keels. Above the band the growth lines bend backwards forming with it an angle of about 60 degrees. Immediately below the band they are inclined at about 45 degrees; they curve forward and downward and are almost vertical at the base of the whorl. The surface is nearly flat between the sub-sutural keel and the band but is more convex below; moulds of the interior are strongly and evenly convex. The aperture is not known. *Goniostropha cambria* Donald[2] from the Lower Ludlow of Llangadock, Wales, is smaller; it has proportionately lower whorls and lacks the keel at the suture. *G.* (?) *elegans* (Sollas)[3] from the Wenlock of Rhymney has keels both above and below the suture and has more angular whorls.

There are in addition to the above Stonehouse specimens three or four specimens of a highly spired Pleurotomeriid in the Ross Brook formation, but they are too crushed to identify.

Horizon and Locality. Very rare in zone a of the Moydart, very rare in zones a and b and common in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5651, 5650.

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[1] Geol. Minn. 3, pt. 2, 1897, pp. 1012, 1013.
[2] Quart. Jour. Geol. Soc. Lond., 61, 1905, p. 571, Pl. 37, fig. 6.
[3] Quart. Jour. Geol. Soc. Lond., 58, 1902, p. 321, Pl. 7, figs. 2-4.

Goniostropha (?) *arisaigensis* (Hall)

1860. *Murchisonia arisaigensis* Hall, Can. Nat. Geol. 5, p. 154.
1868. *Murchisonia arisaigensis* Dawson, Acad. Geol., 2d. ed., p. 604.
1915. *Murchisonia arisaigensis* Bassler, Bull. U.S. Nat. Mus., 92, p. 839.

Original Description. "Shell teretely conical, volutions about five, gradually increasing from the apex, rounded with a slight angulation or carina in the middle. The surface is unknown and the angular band on the volution is the only means of determining its generic relations."

This must be a very rare species at Arisaig.

Horizon and Locality. Very rare and probably from the Stonehouse formation, Arisaig, N.S.

Goniostropha ? sp.
Plate XXI, figure 21

This is a very rare shell and too poorly preserved for description.

Horizon and Locality. Very rare in zone c of the Stonehouse formation, Arisaig, N.S.

Type. Peabody Museum of Yale University; Cat. No. 466.

Genus, *Hormotoma* Salter

1859. *Hormotoma* Salter, Geol. Surv., Can., Can. Org. Remains, Dec. 1, 1859, pp. 18, 22.
1897. *Hormotoma* Ulrich and Schofield, Geol. Minn., 3, pt. 2, pp. 959, 1012.
1899. *Hormotoma* Donald, Quart. Jour. Geol. Soc. Lond., 55, p. 257.

Elongate, smooth Pleurotomariidae having numerous convex to subangular whorls. Band flat or slightly depressed: not delimited by strong threads or keels. Outer lip has a deep sinus, which is indicated by the sharply deflected growth lines. Genotype, *Hormotoma salteri* Ulrich.

Hormotoma amii n.sp.
Plate XX, figure 22

This species is based on a single small specimen about 12 mm. long. It has at least 5 whorls. The largest whorl preserved is 6 mm. wide and 3·5 mm. high. The band is level with the somewhat compressed surface of the whorl and situated a little below the middle. It is not delimited by threads or striæ. The sutures are rather deep and oblique. *Hormotoma cingulata* (Hisinger)[1] has similar broad, flattened whorls but is much larger, has fine spiral striæ, has the slit-band higher on the whorl, and the slit-band is more depressed and delimited by fine threads. *H.* ? *piperi* Donald[2] is larger and has more convex whorls. *H. griffithi*[3] Donald is larger, has more narrow whorls, and the band is situated higher on the whorl. *H. articulata* (Sowerby)[4] is larger, has more convex and more narrow whorls, and the band is depressed. *H. grayiana* Donald[5] is larger, has more convex whorls, the band is delimited by a raised line on either side, and there is a raised thread at the suture. In the American Silurian, *H. whiteavsi* Clarke and Ruedemann[1] is much larger, has more convex whorls, and the band is higher on the whorls. *H. subulata* (Conrad)[2] is larger and has proportionately higher whorls. *H. subcarinata* Grabau[3] and *H. tricarinata* Grabau[4] have prominent keels at the band. The species is named for Dr. H. M. Ami.

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[1] Quart. Jour. Geol. Soc. London, 55, p. 264, Pl. 21, figs. 14-17.
[2] Quart. Jour. Geol. Soc. London, 55, p. 266, Pl. 22, figs. 1, 2.
[3] Quart. Jour. Geol. Soc. London, 55, p. 267, Pl. 22, figs. 3-5.
[4] Quart. Jour. Geol. Soc. London, 55, p. 268, Pl. 22, figs. 7, 8.
[5] Quart. Jour. Geol. Soc. London, 55, p. 270, Pl. 22, fig. 10.

Horizon and Locality. Very rare (1 specimen) and probably from the Stonehouse formation, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5652.

Genus, *Liospira* Ulrich and Schofield

1897. *Liospira* Ulrich and Schofield, Geol. Minn., 3, pt. 2, p. 953.

Smooth, sublenticular, depressed Pleurotomariidae; deeply notched aperture and a broad, scarcely distinguishable, band. The lines of growth are strongly deflected backward but do not curve sigmoidally as in the Raphistomidae. *Platyschisma* McCoy lacks the slit-band and has only slightly oblique growth lines, indicating a broad sinus instead of a deep notch in the outer lip. Genotype, *Pleurotomaria micula* Hall.

Liospira cf. *affinis* (Foerste)

Plate XX, figures 26, 27

Compare with:

1885. *Raphistoma affinis* Foerste, Bull. Sci. Lab. Den. Univ., 1, 1885, p. 95, Pl. 14, fig. 18.
1893. *Raphistoma affinis* Foerste, Geol. Surv. Ohio, Pal. 7, pt. 2, p. 550, Pl. 26, fig. 18; Pl. 37 A, figs. 1 a-c.

The Beechhill formation contains a few specimens of a *Liospira* of the *L. affinis* (Foerste)[5] type. They are all a little below the average size of that species and have three rapidly enlarging whorls, which are flattened above the angular periphery and are more convex below. The size is about half that of *L. marklandensis* n.sp., but as the surface is not preserved further comparison cannot be made. A few crushed specimens in the Ross Brook and McAdam are probably identical.

Height about 4 mm., width 10-12 mm.

Horizon and Locality. Rare in the Beechhill formation, Rory McDonald brook, very rare in zones d and e of the Ross Brook, and very rare in zone c of the McAdam formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 480.

Liospira marklandensis n.sp.

(*Markland*, Nova Scotia in Scandinavian mythology)

Plate XX, figures 23, 24

Depressed, lenticular in form. Three to four rapidly expanding whorls; whorls abruptly rounded on the periphery, somewhat flattened above and convex below. A shallow, faintly impressed furrow is present on the body whorl, just above the periphery. The umbilicus is small. Height to width in the ratio of about one to three. The periphery is not so sharply angulated and the size, on the average, is somewhat greater, as compared with *Liospira affinis* (Foerste). The growth lines are directed forward at the suture and curving outward they gradually turn backward, and finally are almost parallel to the border of what is considered to be the slit-band. In *L. affinis* they are directed outward, not forward, at the suture, are not so strongly convex, and not so strongly turned backward at the band. *Liospira perlata* (Hall)[1] from the Guelph of Ontario, etc., differs considerably from both of the species discussed above; it is much larger and has more numerous and more gradually expanding whorls. *Trochus helicites*[2] Sowerby from the Ludlow and passage beds of England, and the type of the genus *Platyschisma* McCoy, apparently differs generically, but closely resembles the Arisaig species in form and number of volutions. The shell identified by H. S. Williams[3] as *P. helicites* (Sowerby) in the Pembroke formation of Maine has a much greater proportional height; as the illustrations of this species do not portray the lines of growth, no comparison can be made on this basis.

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[1] Mem. N.Y. State Mus. 5, 1903, p. 72, Pl. 8, figs. 5-9.

[2] Pal. N.Y., 2, 1852, p. 91, Pl. 28, figs. 7 a, b, c, d.

[3] Mich. Geol. Biol. Surv. Pub. 2, Geol. ser. 1, 1910, p. 173, Pl. 24, figs. 1-5.

[4] Mich. Geol. Biol. Surv. Pub. 2, Geol. ser. 1, 1910, p. 175, Pl. 25, figs. 3-4.

[5] Geol. Surv. Ohio, 7, pt. 2, 1893, p. 550, Pl. 26, fig. 18; Pl. 37 a, figs. 1 a-c.

Height 7 mm., width 21 mm.

Horizon and Locality. Rare in zone b and common in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5654.

Genus, *Seelya* Ulrich

1897. *Seelya* Ulrich, Geol. Minn., 3, pt. 2, pp. 958, 1011.

Turbinate Pleurotomariidae which have rapidly expanding whorls and are ornamented with spiral threads or ridges. Slit-band prominent. Aperture has shallow sinus, but no slit. Donald[4] places similar Silurian shells under *Bembexia* Oehlert, a genus, however, to which Ulrich and Schofield[5] give a very different interpretation; *Pleurotomaria lloydi* Sowerby certainly cannot be placed under *Seelya* Ulrich, if it possesses a slit. The presence or absence of a slit in the Arisaig species is not known. Genotype, *Seelya ventricosa* Ulrich.

Seelya moydartensis n.sp.

Plate XXI, figures 11, 12

This species resembles *Pleurotomaria lloydi* Sowerby[6]. It is moderately conical, and there are more than five convex whorls; a narrow, but prominent, concave band is situated a little above the middle of the whorl and is bordered on either side by a strong keel. The surface is slightly convex above the band but is more convex below. Above the keel of the band, instead of the two revolving "threadlike ridges" of Sowerby's species, there is a revolving shallow furrow, followed above by a low inconspicuous ridge, against which the backward curving wrinkles of growth from the suture die out. Below the band are about five strong revolving ridges, having finer parallel striations between; according to McCoy[1] there are six or seven in *P. lloydi*, but Sowerby records five. The Arisaig species is proportionately much less high than Sowerby's figure of *P. lloydi*, but McCoy states that he has not seen specimens so elongate. The Gotland specimens of *P. lloydi* have more revolving ridges both above and below the band than the English ones. *Bembexia*? *groomi* Donald[2] is much smaller, has less convex whorls, has a proportionately broader band, and two revolving threads above the band.

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[1] Pal. N.Y., 2, 1852, p. 349, Pl. 84, figs. 5 a-c.
[2] Sil. Syst., 1839, p. 603, Pl. 3, figs. 1 e and 5—McCoy, Brit. Pal. Foss., 1855, p. 297.
[3] Proc. U.S. Nat. Mus., 45, 1913, p. 348, Pl. 31, figs. 15, 16, 18.
[4] Quart. Jour. Geol. Soc. Lond., 61, 1905, p. 568.
[5] Geol. Minn. 3, pt. 2, 1897, pp. 954, 955.
[6] Murchison's Sil. Syst., 1839, p. 619, Pl. 8, fig. 14.

Height 40 mm., width 30 mm.

Horizon and Locality. Common in zone a of the Moydart formation, coast section, Arisaig, N.S. *Pleurotomaria lloydi* Sowerby is reported from the Wenlock and Ludlow and *Bembexia* ? *groomi* Donald is found in the Lower Ludlow and Aymestry limestone of Great Britain.

Type. Peabody Museum of Yale University; holotype, Cat. No. 464; paratype, Cat. No. 464a.

Family, TROCHONEMATIDAE Ulrich
Genus, *Cyclonema* Hall

1852. *Cyclonema* Hall, Pal. N.Y., 2, p. 89.

Turbinate Trochonematidae ornamented with revolving striæ. Genotype, *Pleurotomaria bilix* Conrad.

Cyclonema parvimedium n.sp.
(*parvus*, small; *medius*, middle)
Plate XXI, figures 13, 14

Cyclonema parvimedium n.sp., belongs to a small group of *Cyclonema* in the Ordovician and Pre-Clinton Silurian which possesses a characteristic sculpture. The revolving threads or striations are crossed by transverse raised striæ, directed backward. The subconical form, height almost equal to width, the three or four rapidly expanding whorls, and the triangular section of the whorls are all in agreement with *Cyclonema bilix* (Conrad)[3] from the Richmond of Indiana and Ohio. In the Arisaig species the height is proportionately slightly less and the details of sculpture differ slightly. The revolving striations are not "more or less regular" but are alternately coarse and fine. The aperture is not preserved. The earlier Ordovician forms, including *C. mediale* Ulrich[4] from the Lorraine of Ohio and *C. inflatum* Ulrich[5] from the Lorraine of Cincinnati have more convex whorls. *C. daytonensis* Foerste[6] from the Brassfield of Ohio and Alexandrian of Missouri and Illinois belongs to the same group but has more convex whorls than the Arisaig species; it exhibits wrinkles of growth which are present to some extent in both *C. bilix* and *C. parvimedium*. *Turbo crebistria* McCoy[7] from the late

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[1] Brit. Pal. Foss., 1855, p. 293.
[2] Quart. Jour. Geol. Soc., 61, 1905, p. 569, Pl. 37, fig. 4.
[3] Geol. Minn., 3, pt. 2, 1897, p. 1058, Pl. 58, figs. 35-39.
[4] Geol. Minn., 3, pt. 2, 1897, p. 1059, Pl. 78, figs. 29, 30.
[5] Geol. Minn., 3, pt. 2, 1897, p. 1060, Pl. 78, figs. 31, 32.
[6] Geol. Surv. Ohio, 7, pt. 2, p. 551, Pl. 26, fig. 15; Pl. 30, fig. 15.
[7] Brit. Pal. Foss., 1855, p. 295, Pl. 1 K, fig. 36; Pl. 1 L, fig. 22.

Ordovician of Wales probably possesses the sculpture of this group, but illustrations of this species are not in sufficient detail for comparison; the whorls are more convex; McCoy's figure 22 (Plate 1 L) comes very near to the form of the Arisaig species.

Height 29 mm., width 30 mm.

Horizon and Locality. Rare in the Beechhill formation, Beechhill cove and Rory McDonald brook, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5655.

Cyclonema haliburtoni n.sp.
Plate XXI, figure 3

All the specimens are badly crushed. They have three to four rapidly enlarging whorls and an apical angle of more than 60 degrees. The largest whorl preserved has a diameter of 8 mm. The surface is ornamented with 8 or 9 revolving threads, separated by relatively broad concave interspaces. The species name is given for I. C. Haliburton, Nova Scotian author.

Horizon and Locality. Common in zone d of the Ross Brook formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 462b.

Genus, *Holopea* Hall

1847. *Holopea* Hall, Pal. New York, 1, p. 169.
1897. *Holopea* Ulrich and Schofield, Geol. Minn., 3, pt. 2, p. 1064.

Trochonemidae having a thin and simple inner lip. Spiral ornamentation faint or absent. Genotype, *Holopea symmetrica* Hall.

Holopea caecistriata n.sp.
(*caecus*, obscure)
Plate XXI, figure 1

The spire is low and reduced, there are only two or three whorls, and these are much smaller than the large body whorl. The growth lines are directed strongly backward. Aperture not preserved. Differs from *Nerita prototypa* Phillips[1] in its smaller size and in the presence of very small, faint, and numerous revolving striæ in addition to the transverse striæ of growth. The spire of *Holopea obsoleta* (Hall)[2] is proportionately still smaller than that of the Arisaig species and it lacks the revolving striæ.

Body whorl, height 8 mm., diameter 9 mm.
First whorl of spire, height 1 mm., diameter 3 mm.

Horizon and Locality. Very rare and exact horizon not known; probably from the Moydart or Stonehouse, Arisaig, N.S. *Nerita prototypa* Phillips' is reported from the Wenlock of England. *Holopea obsoleta* (Hall) is found in the Clinton of New York.

Type. Victoria Memorial Museum; holotype, Cat. No. 5656.

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[1] Mem. Geol. Surv., Great Britain, 2, pt. 1, p. 358.
[2] Pal. N.Y., 2, 1852, p. 90, Pl. 28, figs. 3 a, b.

Holopea reversa Hall

1860. *Holopea reversa* Hall, Can. Nat. Geol. 5, p. 154, Fig. 14.
1868. *Holopea reversa* Dawson, Acad. Geol., 2d. ed., p. 605, Fig. 211.
1915. *Holopea reversa* Bassler, Bull. U.S. Nat. Mus., 92, p. 630.

Original Description. "Shell small, sinistral; spire depressed, volutions about three; the two first small and gradually expanding, the last one rapidly expanding and ventricose; aperture wide expanded; suture impressed. Surface unknown. This shell has the general form of Holopea, but I have seen only a single specimen, which is a cast. It is remarkable and readily recognized from the sinistral spire."

This species must be very rare, as it has not been met with in the collections studied.

Horizon and Locality. Very rare at Arisaig, N.S. Locality and horizon not known.

Holopea ? sp.
Plate XXI, figure 2

This is a small species, having about three whorls. Spire low. Body whorl large and not so high as in *H. caecistriata* n.sp.

Horizon and Locality. Very rare in the Beechhill formation, west point of Beechhill cove, Arisaig, N.S.

Type. Peabody Museum of Yale University; Cat. No. 462a.

Family, CAPULIDAE Cuvier
Genus, *Diaphorostoma* Fischer

1885. *Diaphorostoma* Fischer, Man. Conch., p. 756.
1901. *Diaphorostoma* Grabau, Bull. N.Y. State Mus., 45, p. 211.

Capulidae having a low depressed spire and a very large body whorl. The slightly thickened inner lip rests against the body whorl. Genotype, *Platyostoma ventricosum* Conrad.

Diaphorostoma cornutum var. *arisaigensis* n.var.
Plate XXI, figures 8 to 10

Species Reference:
1837. *Pileopsis cornuta* Hisinger, Lethaea Svecica, 41, Pl. 12, fig. 11.
1881. *Platyceras cornutum* Lindström, Kongl. Sven. Vet.-Akad. Handl., 19, p. 63, Pl. 2, figs. 29-51; Pl. 3, figs. 6-9, 19-26.

Diaphorostoma cornutum (Hisinger), as interpreted and figured by Lindström, exhibits much variation and may even embrace more than one species. In general form the Arisaig specimens resemble Lindström's Figures 32, 33, and 40[1] in which the spire is low and only consists of two or three whorls which scarcely rise above the upper flattened margin of the greatly enlarged body whorl. The cross-section of the body whorl is subrhomboidal, due to the partial flattening of the upper and outer margins and the base. The Arisaig species differs in particular from the cited figures of Lindström by having the outer margin more nearly at right angles to the upper surface of the body whorl. The anterior portion of the body whorl is not preserved. Sowerby's figure of *Platyceras haliotis*[1] Sowerby shows a more convex outer margin. *Diaphorostoma niagarensis* (Hall)[2] has a more pronounced spire.

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[1] Op. cit., Pl. 2.

Size. Height 22 mm., diameter 22 mm.

Horizon and Locality. Very rare in zone c of the McAdam, rare in zone a of the Moydart, and very rare in zone c of the Stonehouse, coast section, Arisaig, N.S. *Diaphorostoma haliotis* (Sowerby) occurs in the Wenlock of Great Britain. *Diaphorostoma cornutum* (Hisinger) is found in all the Silurian strata of Gotland.

Type. Victoria Memorial Museum; holotype, Cat. No. 5657.

Suborder, PTEROPODA Cuvier
Family, HYOLITHIDAE Nicholson
Genus, *Hyolithes* Eichwald

1840. *Hyolithes* Eichwald, Sil. Sch. Syst. Ehstland, p. 97.
1886. *Hyolithes* Walcott, Bull. U.S. G.S. 30, p. 131.

Bilaterally symmetrical, rapidly tapering, cone-like or elongate pyramidal shells; cross-section triangular to elliptical and more rarely quadrangular. Aperture closed by an operculum. Genotype, *Hyolithes acutus* Eichwald.

Hyolithes forbesi (Sharpe)
Plate XXI, figure 7

1846. *Theca forbesi* Sharpe, Quart. Jour. Geol. Soc. Lond. 2, p. 314, Pl. 13, figs. 1 a-d.
1855. *Theca forbesi* McCoy, Sedgewick and McCoy's Brit. Pal. Rocks and Fossils, p. 287.
1892. *Theca* n.sp., Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 190.

McCoy's Description. "Margins of flat sides, converging at an angle of about 19 degrees; surface marked with coarse transverse lines, more than their thickness apart, and close striæ; section nearly an equilateral triangle; mesial ridge slightly rounded, about 92 degrees; average length about nine lines, width of mouth about three lines."

The Arisaig specimens from the Stonehouse formation are larger than those described by McCoy and attain a length of 25 to 29 mm. As they are compressed in shale the cross-section and rate of expansion cannot be determined. As preserved in crushed specimens the apical angle is from 20 degrees to 29 degrees, but is actually probably less and nearer that of the British specimens of the species. Faint transverse growth lines are preserved and they suggest a projecting margin on one side of the aperture. The greater size is the only demonstrable distinction between the Arisaig and the British specimens.

In the McAdam there is a small specimen, partly compressed in shale, which has a length of 14 mm. and an apical angle of 19 degrees. Another, showing 7 mm. of the apical region, has an apical angle of 20 degrees.

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[1] Sil. Syst., 1839, p. 625, Pl. 12, fig. 16.
[2] Pal. N.Y., 2, 1852, p. 287, Pl. 60, figs. 1 a-u.

Both these specimens probably belong to this species. A third specimen from the McAdam, consisting of the apical extremity of a shell, has an apical angle of 30 degrees and is probably distinct from the species under discussion.

Horizon and Locality. Very rare in zone e of the Ross Brook, very rare in zone c of the McAdam, very rare in zone a of the Moydart, and rare in zone c of the Stonehouse, coast section, Arisaig, N.S. Found in the Upper Ludlow of Wales.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 5658.

Family, TENTACULITIDAE Walcott

Genus, *Tentaculites* Schlotheim

1820. *Tentaculites* Schlotheim, Die Petrefactenkunde, p. 377.
1855. *Tentaculites* McCoy, Sedgewick and McCoy's Brit. Pal. Rocks and Fossils, p. 63.
1872. *Tentaculites* Nicholson, Am. Jour. Sci. (3), 3, p. 205.
1882. *Tentaculites* Vine, Quart. Jour. Geol. Soc. Lond., 38, p. 385.

Long and slowly tapering conical tubes, in most species ornamented with transverse rings and growth lines. There are no longitudinal fine lines as in *Cornulites* which is often confounded with *Tentaculites*; the former is cemented to foreign objects, whereas the latter is free throughout life. Genotype, *Tentaculites scalaris* Schlotheim.

Tentaculites canadensis Ami

Plate XXI, figures 5, 6

1894. *Tentaculites canadensis* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 412.
1915. *Tentaculites canadensis* Bassler, Bull. U.S. Nat. Mus., 92, p. 1260.

Original Description. "Shell minute, elongate, very gradually tapering. Annulations thread-like and numerous, there being *seventeen* in the space of five millimetres. Intermediate spaces marked by very fine transverse lines of which there are from six to seven present between two annulations. Diameter of tube at greater extremity, 0.5 mm. Inasmuch as the specimen examined has its apex and portion of the initial portion of the tube broken off, it cannot be ascertained whether this portion of the shell was annulated or smooth."

The description of Ami refers to the earlier portion of the shell, for the species grows to much larger size than originally defined. The maximum known diameter of the body of the shell is 1·5 mm. and the corresponding diameter of the rings about 2·5 mm. In the distal part, the annulations are from 0·75 to 1·25 mm. apart. Apically, however, they become more closely spaced and near the apex may be 3 to 7 in 1 mm. In some specimens the annulations at the apex and within 2 mm. of it are so closely spaced as to be in contact. The annulations are at first not only closely but also rather irregularly spaced, but with age become more regularly arranged. Preservation of the interspaces between the rings is commonly not good enough to show growth lines. The shell is very slender, expanding at the rate of about $\frac{1}{2}$ to $\frac{3}{4}$ mm. in 12 mm. in the apical part, and in the distal portion expanding at the rate of about $\frac{3}{4}$ mm. in 12 mm. (or $\frac{3}{4}$ to $\frac{5}{16}$ in 10 mm.).

Compared with *Tentaculites minutus* Hall,[1] *T. niagarensis* Hall[2], and *T. tenuis* Sowerby[3] it is much larger. *T. gyracanthus* (Eaton)[4] is said to have 3 annulations per 1 mm.[5] *T. ornatus* Sowerby[6] has somewhat more closely spaced annulations.

Horizon and Locality. Very rare in the Beechhill formation, Beechhill cove, very rare in zones b and c, common in zone d, and very rare in zone e of the Ross Brook, common in zone b and very rare in zone c of the McAdam, common in zone a of the Moydart, rare in zones a and b, common in zone c, and rare in zone d of the Stonehouse, coast and Stonehouse Brook sections, Arisaig, N.S. Described from cape George, Antigonish county, N.S.

Types. Peabody Museum of Yale University; plesiotypes, Cat. Nos. 463, 463a.

Tentaculites canadensis var. *obtusiformis* n.var.

(*obtusus*, blunt)

Plate XXI, figure 4

There are two specimens, apparently from the McAdam, which expand much more rapidly than the others. One of them attains a body diameter of 1 mm. and a ring diameter of 1·5 mm. in 7 mm. The other expands from 0·3 mm. to 1 mm. (body diameter) in 10 mm. This is to be contrasted with the characteristic slenderness of the normal species.

Horizon and Locality. Very rare and probably from the McAdam formation, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5659.

Class, *CEPHALOPODA*

Order, **Nautiloidea** Zittel

Genus, *Orthoceras* Breynius

1832. *Orthoceras* Breynius, Dissertatio Physica de Polythalamiis, p. 12.
1882. *Orthoceras* Blake (part), Mon. Brit. Foss. Ceph., pt. 1, p. 48.
1884. *Orthoceras* Hyatt, Proc. Bost. Soc. Nat. Hist., 22, p. 275.
1900. *Orthoceras* Hyatt, Zittel-Eastman Textb. Pal., 1, p. 518.
1906. *Orthoceras* Ruedemann, Bull. N.Y. State Mus., 90, p. 432.
1913. *Orthoceras* Hyatt, Zittel-Eastman Textb. Pal., 2d. ed., p. 598.

More or less long orthoceracones; body chamber rarely contracted; surface smooth or has transverse striæ and bands of growth. As interpreted here this genus also includes conchs which have fine longitudinal striæ.

The Arisaig species are:

Smooth or having striæ of growth (=*Orthoceras*, sens.—strict.)
    Orthoceras mcadamense n. sp.; in the McAdam
    O. ludense var. *camerini* n. var.; in the Moydart
    O. antigonishense n. sp.; in the Stonehouse
    O. punctostriatum Hall; in the Stonehouse
    O. confertiseptatum n. sp.; in the Moydart and Stonehouse
    O. marklandense n. sp.; in the Stonehouse
    Orthoceras sp.; in the Moydart
Having longitudinal striation (intermediate with *Kionoceras* Hyatt)
    O. bullatum var. *pictoense* (Dawson); in the Moydart

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[1] Pal. N.Y., 2, 1852, p. 183, Pl. A41, figs. 8a-e.
[2] Pal. N.Y., 2, 1852, p. 352, Pl. 85, figs. 11, 12.
[3] Murchison's Sil. Syst., p. 613, Pl. 5, figs. 33, 33a.
[4] Pal. N.Y., 3, 1859, p. 137, Pl. 6, figs. 33, 33a.
[5] Geol. Surv., N.J., Pal. 3, 1903, p. 264, Pl. 24, figs. 19-20.
[6] Murchison's Sil. Syst., p. 628, Pl. 12, fig. 25.

Orthoceras mcadamense n. sp.

Plate XXI, figures 17, 18

One specimen from the McAdam is 25 mm. long, has a maximum diameter of 17 mm., and a taper of about 1 in 25. The depth of the cameræ is from $\frac{1}{6}$ to $\frac{1}{8}$ of the diameter, which is less than in *Kionoceras angulatum* (Wahlenberg). The septa are much more convex than in that species, the convexity amounting to $\frac{1}{3}$ the diameter. The cross-section is slightly subquadrangular, as 16 to 17, and somewhat flattened on the sides. The surface is not preserved. Another specimen from the McAdam formation probably represents the proximal portion of the same species; it is flattened down in shale, is about 30 mm. long, has a maximum diameter of 12 mm., and tapers 1 in 15; the cameræ are shallow, $\frac{1}{9}$ to $\frac{1}{10}$ of the diameter.

Horizon and Locality. Very rare in zone c of the McAdam formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 465b.

Orthoceras ludense var. *camerini* n. var.

Plate XXII, figures 1 to 6

Species Reference:

1839. *Orthoceras ludense* Sowerby, Murchison's Sil. Syst., p. 619, Pl. 9, fig. 1.
1855. *Orthoceras ludense* McCoy, Brit. Pal. Foss., p. 315.
1882. *Orthoceras ludense* Blake, Mon. Brit. Foss. Ceph., pt. 1, p. 156, Pl. 10, figs. 1, 3, 4, 5, 7.

Only a few incomplete specimens have been collected and neither the surface characters nor the body-chamber is known. The taper is gentle, about 1 in 18, and, therefore, only a little less than in *Orthoceras ludense* Sowerby. The depth of the camera, about $\frac{1}{4}$ of the diameter, and the convexity of the septa, also about $\frac{1}{4}$ of the diameter, are as in *O. ludense*. The siphuncle is eccentric and situated from $\frac{1}{10}$ to $\frac{1}{15}$ of the diameter from the centre. In *O. ludense* it varies from central to slightly eccentric. The largest diameter known is 30 mm. The cameræ are deeper than in *O. gregarium* Sowerby[1] or *O. antigonishense* n. sp., but not so much as in *O. medullare* Hall.[2]

Horizon and Locality. Rare in zone a of the Moydart formation, coast section, Arisaig, N.S. According to Blake, *Orthoceras ludense* Sowerby ranges from the Upper Llandovery to the Upper Ludlow of Great Britain. In the Christiania section, a closely related form is found in etage 8a.

Types. Victoria Memorial Museum; holotype, Cat. No. 5660: Peabody Museum of Yale University; paratypes, Cat. Nos. 467, 467a.

Orthoceras antigonishense n. sp.

Plate XXII, figures 7, 8; Plate XXV, figure 3

Compare with:

1839. *Orthoceras gregarium* Sowerby, Murchison's Sil. Syst., p. 619, Pl. 8, fig. 16.
1846. *Orthoceras gregarium* McCoy, Sil. Foss. Ireland, p. 8.
1882. *Orthoceras gregarium* Blake, Mon. Brit. Foss. Ceph., pt. 1, p. 147, Pl. 15, figs. 4, 5.

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[1] Mon. Brit. Foss. Ceph., pt. 1, p. 147, Pl. 15, figs. 4, 5.

[2] 20th Rept. N.Y. State Cab. Nat. Hist., 1868, p. 353, Pl. 20, figs. 1, 2.

Neither the proximal portion of the cone, nor the body-chamber of this species has been collected. Diameters of 17 mm. to 40 mm. are known. The longest unbroken specimen is 80 mm., but judging from the gentle taper the complete conch must be much over one foot in length. In the smaller sections, the gentle taper, from about 1 in 14 to 1 in 17, and the depth of the cameræ, $\frac{1}{4}$ the diameter, are much as in *Orthoceras gregarium* Sowerby. Our species, however, is larger and longer than any of the described specimens of *O. gregarium* and the depth of the cameræ becomes proportionally less with age, $\frac{1}{8}$ of the diameter. The surface, as in the British species, is covered with growth lines and subdued, somewhat irregular, lamellæ of growth. The structure of the inner layers, viewed from the exterior, is punctate, and there are occasional longitudinal furrows; compared with *O. punctostriatum* Hall, this structure is finer and less furrowed. In *O. ludense* Sowerby[1] the proportional depth of the cameræ is much greater, particularly in the later growth stages.

O. recticinctum[2] Blake is smaller and ornamented with "sharp transverse riblets." *O. grinrodi*[3] Blake has "vertical sharp separate riblets, or crinkly lamellæ."

Horizon and Locality. Very rare in zone a and common in zone c of the Stonehouse formation, coast section, Arisaig, N.S. *Orthoceras gregarium* Sowerby is reported[4] from the Bala to Lower Ludlow of England, Wales, etc.

Types. Victoria Memorial Museum; holotype, Cat. No. 5661: Peabody Museum of Yale University; paratypes, Cat. Nos. 467b, 467c.

Orthoceras punctostriatum Hall
Plate XXII, figure 9; Plate XXIX, figure 12

1860. *Orthoceras punctostriatum* Hall, Can. Nat. Geol., 5, p. 154, Fig. 15.
1868. *Orthoceras punctostriatum* Hall, Acadian Geol., 2d. ed., p. 605, Fig. 212.
1892. *Orthoceras punctostriatum* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 191.
1915. *Orthoceras punctostriatum* Bassler, Bull. U.S. Nat. Mus., 92, p. 913.

Original Description. "Shell slender, very gradually tapering, almost cylindrical; septa distant about one-third the diameter. Siphuncle central; section circular. Surface very finely striated with unequal undulating striæ, the interstices between which are punctæ which are oblong indentations often becoming confluent.

"This species is remarkable for its extremely gently tapering form; the fragment of more than an inch long, showing scarcely a perceptible diminution in diameter. There are twelve and a half chambers in the space of one inch. The surface markings are peculiar, and among the species of the genus known to us constitute a distinctive character."

The striations and punctæ referred to are not on the surface but are a part of the structure of the inner layers of the shell wall. This structure is coarser and the longitudinal striæ or furrows are longer than in *Orthoceras antigonishense* n. sp. In the latter the punctæ are more numerous. The surface is apparently smooth. There is a single specimen in the Yale collections of this rare species. It is 25 mm. long and in that length tapers from 12 to 10 mm. or about 1 in 12. The cameræ are 2 to 2½ mm. deep. The convexity of the septa is 1½ mm.

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[1] Mon. Brit. Foss. Ceph., pt. 1, p. 156, Pl. 10, figs. 1, 3, 4, 5, 7.
[2] Mon. Brit. Foss. Ceph., pt. 1, p. 121, Pl. 11, fig. 4.
[3] Mon. Brit. Foss. Ceph., pt. 1, p. 122, Pl. 9, fig. 9.
[4] Mon. Brit. Foss. Ceph., pt. 1, p. 148.

Horizon and Locality. Very rare in zone b of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; plesiotype, Cat. No. 467d.

Orthoceras confertiseptatum n.sp.

(*confertus*, closely arranged; *septum*, wall)

Plate XXIII, figures 2, 3

A fragmental specimen from the Moydart is about 70 mm. long, and preserves neither the early portion nor the body-chamber. The depth of the cameræ is $\frac{1}{8}$ to $\frac{1}{11}$ of the diameter. In 60 mm. the shell contracts from 38 mm. to 25 mm. in diameter. The siphuncle is eccentric, a little less than $\frac{1}{5}$ diameter from the centre. The cross-section is slightly elliptical, nearly as 7 to 8. The surface is not preserved. Two specimens in the Stonehouse, having the same close septa and rapid enlargement of the shell, are referred to this species. They are both crushed and embedded in shale.

Horizon and Locality. Very rare in zone a of the Moydart and very rare in zones b and c of the Stonehouse, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 467f.

Orthoceras marklandense n.sp.

Plate XXI, figure 20

A small, slender, gently tapering species, of which the living chamber is preserved. Outer surface not preserved. The arrangement of the septa is quite close, about 6 in 10 mm. Section oval. It is smaller than *O. confertiseptatum* n.sp., and is not conical. It is smaller, has closer septa, and a more oval cross-section than *O. mcadamense* n.sp.

Horizon and Locality. Very rare in zone c of the Stonehouse, coast section, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5583.

Orthoceras sp.

Plate XXI, figure 19

The only known specimen, which includes a part of the living chamber, has very closely arranged septa and in this resembles *Orthoceras mcadamense* n.sp.; the arrangement is slightly closer than in that species, but as both species are rare in occurrence, allowance must be made for variation. The section does not appear to be subquadrate, but the preservation does not permit of a definite conclusion. For these reasons a new name is not given to this specimen, although it may constitute a species distinct from *O. mcadamense.*

Horizon and Locality. Very rare in zone a of the Moydart formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; Cat. No. 465c.

Orthoceras bullatum var. *pictoense* (Dawson)

Plate XXIII, figures 1, 4, 5; Plate XXIV, figure 9; Plate XX, figure 19

1880. *Orthoceras pictoense* Dawson, Can. Nat., N.S., 9, p. 343.
1915. *Orthoceras pictoense* Bassler, Bull. U.S. Nat. Mus., 92, p. 912.

Species Reference:

1839. *Orthoceras bullatum* Sowerby, Murchison's Sil. Syst., Pl. 5, fig. 29, p. 612.
1882. *Orthoceras bullatum* Blake, Mon. Brit. Foss. Ceph., pt. 1, p. 129, Pl. 12, figs. 4, 5.

Original Description. "Transverse section oval, perhaps partly a result of pressure. Chambers narrow, 8 in an inch in a specimen 1·5 inch in greatest diameter. Shell scarcely tapering in 5 inches. Surface when perfectly preserved with delicate longitudinal striæ. Siphuncle not well seen but apparently inflated in the chambers. This is seemingly a representative in our Upper Silurian of *O. bullatum* of England."

The depth of the cameræ varies from $\frac{1}{8}$ to $\frac{1}{6}$ of the diameter and averages about $\frac{1}{7}$. The shells taper from 1 in 8 to 1 in 7. Siphuncle slightly eccentric. Longest specimen observed is 190 mm. long and has a corresponding maximum diameter of 40 mm. The longitudinal striations are very characteristic; they are spaced about 45 in 10 mm., and are in groups of 2 and sometimes 3 or 4. This species is very closely related to *Orthoceras bullatum* Sowerby, the spacing of the septa being the same and the tapering probably only a little less; it is similarly finely striated, but actual comparison of specimens would be necessary to determine differences on this basis.

Horizon and Locality. Common in zone a of the Moydart formation, coast section, Arisaig, N.S. Described by Dawson from East river, Pictou county. *Orthoceras bullatum* Sowerby is found in the Wenlock and Ludlow, including Passage beds, of Wales.

Types. Victoria Memorial Museum; lectotype, Cat. No. 5662: Peabody Museum of Yale University; plesiotype, Cat. No. 467e.

Genus, *Dawsonoceras* Hyatt

1882. *Orthoceras* (section Annulati, part) Blake, Mon. Brit. Foss. Ceph., pt. 1, p. 81.
1884. *Dawsonoceras* Hyatt, Proc. Bost. Soc. Nat. Hist., 22, p. 276.
1903. *Dawsonoceras* Clarke and Ruedemann, Mem. N.Y. State Mus., 5, p. 82.
1913. *Dawsonoceras* Hyatt, Zittel-Eastman Textb. Pal., 2d. ed., p. 599.

Annulated orthoceracones or cyrtoceracones ornamented with transverse striæ or frilled bands of growth. Genotype, *Orthoceras annulatum* Sowerby.

Dawsonoceras elegantulum (Dawson)

Plate XXIV, figures 1 to 3; Plate XXIX, figure 7

1860. *Orthoceras elegantulum* Dawson, footnote to Hall, Can. Nat. Geol., 5, p. 155.
1868. *Orthoceras elegantulum* Dawson, Acadian Geology, 2d. ed., p. 606, Fig. 213.
1892. *Orthoceras elegantulum* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 191.
1915. *Orthoceras elegantulum* Bassler, Bull. U.S. Nat. Mus., 92, p. 905.

Dawson's Description of 1868. "This is a very beautiful species, apparently new, but closely resembling *O. perelegans*, Salter, of the Lower Ludlow formation. It is cylindrical, but slightly flattened; septa very convex and one-twentieth of an inch apart in a specimen half an inch in diameter; siphuncle central. Surface with slight rounded annulations from one-eighth to one-fourth of an inch apart, and covered with delicate transverse striæ, scarcely visible to the naked eye, and about sixteen in a line. Under the microscope the striæ appear as thin, sharp, parallel curved ridges, the spaces between being finely granulated and wider than the ridges."

Emend Description. Considerable variation is shown in the taper. One set of specimens chosen indicates a more rapid increase in diameter in the later growth stages:

12 to 8 mm. in 25 mm.
9 to 7 mm. in 17 mm.
6½ to 6 mm. in 10 mm.
6 to 5½ mm. in 15 mm.

Other specimens do not show a uniform rate of expansion:

8 to 7 mm. in 17 mm.
10 to 8 mm. in 16 mm.
13 to 8 mm. in 45 mm.

The specimens preserved in calcareous sandstone have a slight curvature. The depth of the cameræ is ⅓ to ¼ of the diameter. There is a narrow annulation midway between the suture of each septum. Between each annulation there is a broad concave interspace and the whole surface is covered with fine transverse striæ. The annulations tend to become suppressed near the aperture. This species lacks the oblique annulations of *Orthoceras ibex* Sowerby.[1] The slight curvature of the shell separates it from *O. tracheale* Sowerby[2], which is straight. It does not, however, possess the peculiar irregular curvature of *Lituites* ? *ibex* Sowerby[3]. Three specimens, however, having stronger curvature, resemble *Lituites* ? *ibex.*

Horizon and Locality. Rare in zone b, common in zone c, and rare in zone d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotype, Cat. No. 5663: Peabody Museum of Yale University; plesiotype, Cat. Nos. 468, 468a.

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[1] Murchison's Sil. Syst., p. 613, Pl. 5, fig. 30.
[2] Murchison's Sil. Syst., p. 604, Pl. 3, fig. 9 b.
[3] Murchison's Sil. Syst., p. 622, Pl. 11, fig. 6.

Dawsonoceras arisaigense n.sp.

Plate XXI, figures 15, 16

A rather abruptly tapering species. Surface ornamented with fine annulations, set about 8 in 10 mm. Annulations and separating grooves covered with thread-like transverse striæ. Septa not known. The annulations are smaller and more closely arranged than in the preceding species.

Horizon and Locality. Very rare in zone c of the McAdam formation, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 465a; paratype, Cat. No. 465.

Genus, *Kionoceras* Hyatt

1882. *Orthoceras* (section Annulati) Blake, Mon. Brit. Foss. Ceph., pt. 1, p. 106.
1884. *Kionoceras* Hyatt, Proc. Boston Soc. Nat. Hist., 22, p. 275.
1903. *Kionoceras* Clarke and Ruedemann, Mem. N.Y. State Mus., 5, p. 82.
1913. *Kionoceras* Hyatt, Zittel-Eastman Textb. Pal., 2d. ed., p. 600.

Long orthoceracones and cyrtoceracones ornamented with prominent longitudinal ridges; annuli absent or inconspicuous. Genotype, *Orthoceras doricum* Barrande.

Kionoceras angulatum (Wahlenberg)

Plate XXIV, figures 4 to 8; Plate XXV, figure 1;
Plate XXVIII, figure 15; Plate XXIX, figure 4

1821. *Orthoceras angulatum* Wahlenberg, Nova Acta Reg. Soc. Sci. Acad., Upsala, vol. VIII, p. 90.
1839. *Orthoceras virgatum* Sowerby, Murchison's Sil. Syst., p. 620, Pl. 9, fig. 4.
1839. *Orthoceras canaliculatum* Sowerby, Murchison's Sil. Syst., p. 632, Pl. 13, fig. 26.
1852. *Orthoceras angulatum* McCoy, Palæozoic Fossils, p. 313.
1860. *Orthoceras exornatum* Dawson, Can. Nat. Geol., 5, p. 298.
1868. *Orthoceras exornatum* Dawson, Acadian Geology, 2d. ed., p. 606.
1882. *Orthoceras angulatum* Blake, Mon. Brit. Foss. Ceph., pt. 1, p. 106, Pl. 7, figs. 1, 3, 4, 8, 9.
1892. *Orthoceras exornatum* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 191.
1915. *Orthoceras exornatum* Bassler, Bull. U.S. Nat. Mus., 92, p. 905.

Dawson's Description of Orthoceras Exornatum. "This species, collected by Dr. Honeyman at Arisaig, is circular in the cross-section, moderately tapering, and straight; with the siphuncle slightly eccentric, and septa half a line apart, in a specimen two to four lines in diameter. The surface is slightly annulated, and ornamented with about twenty-four flat longitudinal flutings in the manner of a Doric column. The whole surface is also delicately striated transversely."

Emend Description of Arisaig Specimens. The longitudinal ribs number on the average about 21 to 25, although there are a few variations to 18 and 36, and the surface is further ornamented with very fine transverse and longitudinal striæ. The structure of the inner layer exhibits longitudinal slender lines, alternating with punctæ. The spacing of the septa is from about $\frac{1}{5}$ to $\frac{1}{6}$ the diameter. The taper is 1 in 7 to 1 in 9. There are no annulations, but crushed specimens have the appearance of such due to the resistance of the septa to pressure. The preservation is imperfect. The largest diameter known is about 30 mm., allowing for crushing down of the shell in shale. The siphuncle is nearly central.

There are no important differences between the Arisaig and European forms, unless the former are somewhat smaller. The majority of the specimens, having 21 to 25 ribs, resemble the type[1] of Wahlenberg's species; a few, having 25 to 36 ribs, come nearer to the variety described as *Orthoceras virgatum* Sowerby.[2] One specimen in the Ross Brook and two in the Stonehouse have finer lines between the ribs. These approach *O. bacchus* Barrande in ornamentation at least.

Horizon and Locality. Rare in zone e of the Ross Brook, rare in zone b and common in zones c and d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S. It ranges throughout the Silurian of Great Britain, Ireland, Sweden, and Russia.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 3144a, 5664, 5665, 5666: Peabody Museum of Yale University; plesiotype, Cat. No. 469.

Kionoceras angulatum var. *deflectostriatum* n. var.

(*deflecto*, bend)

Plate XXV, figure 4; Plate XXIX, figure 6

There are about three specimens from the Stonehouse which have all the normal characters of the species with the exception that the growth lines, instead of being directed straight across the spaces between the flutings, are deflected proximally, forming a curved striation concave apically.

Horizon and Locality. Very rare in zone b of the Stonehouse formation, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 469b.

Kionoceras latouri n.sp.

Plate XXV, figure 2; Plate XXIX, figure 9

This species has about 30 strong ridges, between each of which are about four fairly prominent striæ. A small specimen has only about 24 strong ridges. The ornamentation resembles that of *Orthoceras bacchus* Barrande (Upper Llandovery to Upper Ludlow of England), but the ridges are not bifid and the size is much smaller. Largest diameter is 12 mm. In *K. angulatum* the striæ between the ridges are finer.

Horizon and Locality. Very rare in zone c of the Ross Brook and very rare in zones b and c of the Stonehouse, coast section, Arisaig, N.S.

Type. Peabody Museum of Yale University; holotype, Cat. No. 469a.

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[1] Mon. Brit. Foss. Ceph., pt. 1, 1882, p. 106.

[2] Murchison's Sil. Syst., 1839, p. 620, Pl. 9, fig. 4.

Kionoceras granosistriatum n.sp.

(*granosus*, full of small grains)

Plate XXV, figures 7, 8

This species is based on a single large specimen, having the long flutings of *Kionoceras angulatum* (Wahlenberg), and about 34 in number. The surface, however, is granulose and especially so on the longitudinal ridges. Diameter of flattened specimen 38 mm.

Horizon and Locality. Very rare and probably from the Stonehouse, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5667.

Genus, *Thoracoceras* Fischer de Waldheim

1844. *Thoracoceras* Fischer de Waldheim, Bull. Soc. Imp. de Nat. de Mosc., 17, p. 755.
1860. *Thoracoceras* Eichwald, Lethaea rossica, 1, pt. 2, p. 1255.
1884. *Thoracoceras* Hyatt, Proc. Bost. Soc. Nat. Hist., 22, p. 275.
1913. *Thoracoceras* Hyatt, Zittel-Eastman Textb. Pal., 2d. ed., p. 600.

Annulated Kionoceratidae having nodose longitudinal ridges. Genotype, *Thoracoceras distans* Fischer de Waldheim.

Thoracoceras erro n.sp.

(*erro*, a wanderer)

Plate XXV, figures 5, 6

Only two small fragments are known. One, embedded in shale, has a diameter of 14 mm. The other, showing the cyrtoceracone outline of moderate curvature, has a maximum diameter of 12 mm. and contracts to 9 mm. in a length of 18 mm. It is smaller than *Thoracoceras corbulatum* (Barrande)[1] from etage E of Bohemia, the annulations are flatter and broader, and the longitudinal ridges are more slender. The annulations are nearly 1 mm. wide and 3 mm. apart. The longitudinal ridges are 3 mm. apart where the diameter is 11 mm. and become more distant distally; they develop acutely nodose processes where they cross the annulations. The depth of the cameræ is about $\frac{1}{7}$ the diameter. The siphuncle is eccentric, about $\frac{1}{6}$ diameter from the centre, but not so distant from the centre as in *Th. corbulatum.*

Horizon and Locality. Very rare in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; holotype, Cat. No. 5668; paratype, Cat. No. 5581.

Genus, *Cyrtorizoceras* Hyatt

1900. *Cyrtorizoceras* Hyatt, Zittel-Eastman Textb. Pal., 1, p. 529.
1913. *Cyrtorizoceras* Hyatt, Zittel-Eastman Textb. Pal., 2d. ed., p. 610.

Laterally compressed cyrtoceracones having a rather short living chamber. Suture has ventral and dorsal saddle. The small tubular siphuncle empty in most specimens. Genotype, *Cyrtoceras minneapolis* Clarke.

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[1] Systeme Silurian de la Bohême, vol. 2, Pl. 125; Pl. 224, figs. 29-31.

Cyrtorizoceras breviradiatum n.sp.

(*brevis*, short; *radius*, half diameter of a circle)
Plate XXV, figures 9 to 11

Compared with *Cyrtorizoceras curvicameratum* Clarke and Ruedemann,[1] the shell of this species is much smaller and much more strongly curved. Only one specimen is known. Measured on the arc of the outer border, it is about 35 mm. long and expands from a diameter of 12 to 18 mm. The radius of curvature is 20 mm. on the outer ventral margin, and $7\frac{1}{2}$ on the inner dorsal border. The section is laterally compressed as 15 to 18. The dorsum or inner side is somewhat wider than the venter or outer side. Siphuncle subventran, assuming this to be an exogastric shell. The cameræ are shallow, less than 1 mm. in depth on the dorsum and 3 mm. on the venter. Sutures have a rather sharp ventral saddle and a low, scarcely perceptible dorsal saddle. Septa concave. Surface apparently smooth and body chamber not known. Both *C. dardanum* (Hall)[2] and *C. fosteri* (Hall)[3] are larger and less strongly curved.

Horizon and Locality. Very rare and from the Moydart or Stonehouse formation, Arisaig, N.S.

Type. Victoria Memorial Museum; holotype, Cat. No. 5582.

Phylum, ARTHROPODA
Class, *CRUSTACEA*
Subclass, TRILOBITA Walch
Order, **Proparia** Beecher
Family, CALYMENIDAE Milne Edwards
Genus, *Calymene* Brongniart

1822. *Calymene* Brongniart, Hist. Nat. Crust. Foss., p. 11.
1865. *Calymene* Salter, Mon. Brit. Tril., Pal. Soc., p. 90.
1888. *Calymene* Hall and Clarke, Pal. N.Y., 7, p. XXI.
1906. *Calymene* Reed, Lower Pal. Tril. Girvan, pt. III, Pal. Soc., pp. 133-138.
1913. *Calymene* Raymond, Zittel-Eastman Textb. Pal., p. 724.

In the cephalon the free cheeks are comparatively narrow; the facia suture extends from near the genal angle to the eye and cuts the anterior margin on either side of the glabella. The glabella is strongly arched, characteristically lobed, and has three pairs of lateral furrows. Hypostome notched posteriorly. Thorax has 13 segments. Pleural lobes of pygidium not smooth as in *Liocalymene* Raymond, but have distinct ribs more or less divided by an impressed line and bifurcating at the extremity. According to Reed, the Silurian species have typically a large overhanging and somewhat swollen frontal lobe and the first pair of lateral lobes are reduced in size. Genotype, *Trilobus tuberculatus* Brünnich.

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[1] Mem. N.Y. State Mus., 5, 1903, p. 90, Pl. 17, figs. 1-10.
[2] 20th Rept. N.Y. State Cab. Nat. Hist., 1867, p. 349, Pl. 17 (8), figs. 3-5.
[3] 20th Rept. N.Y. State Cab. Nat. Hist., 1867, p. 349, Pl. 16 (7), figs. 11-13.

Calymene tuberculata (Brünnich)

Plate XXVI, figures 1, 2

1781. *Trilobis tuberculatus* Brünnich, Dansk. Vid. Selsk. Skrifter; Nye Samling; vol. 1, p. 389.
1822. *Calymene blumenbachii* Brongniart, Hist. Nat. Crust. Foss., p. 11, Pl. 1, figs. 1a-c.
1826. *Calymene tuberculata* Dalman, Patæa., p. 227, Pl. 1, figs. 3a-c.
1839. *Calymene blumenbachii* Murchison, Sil. Syst., p. 653, Pl. 7, figs. 6, 7 (not fig. 5).
1865. *Calymene blumenbachii* Salter, Mon. Brit. Tril., Pal. Soc., p. 93, Pl. 8, figs. 7-16; Pl. 9, figs. 1, 2.
1879. *Calymene blumenbachii* Nicholson and Etheridge (part), Mon. Sil. Foss. Girvan, fasc. 2, p. 140, Pl. 10, fig. 6 (not figs. 2-5).
1885. *Calymene tuberculata* Lindström Ofvers. Vetensk. Acad. Förhandl., p. 63, t. 16, Fig. 9.
1890. *Calymene tuberculata* Pompecki, Ost-und Westpreussische Diluvialgeschiebe, p. 40, t. 6, f. 19.
1894. *Calymene tuberculata* Schmidt, Rec. Ostbalt. Sil. Tril., p. IV, p. 13, Pl. 1, figs. 1-7.
1906. *Calymene blumenbachi* Reed, Lower Pal. Tril. Girvan, pt. III, Pal. Soc., p. 133, Pl. 17, figs. 12, 13.

This species is very rare at Arisaig but is identical with the common Dudley species and corresponds to Salter's description and his figures 7, 8, 13, 14, 16, and probably 10 and 11. The furrow between the glabella and marginal rim is narrow, due to the anterior encroachment of the glabella, and differs therein from the marginal furrow in *Calymene intermedia* Lindström which is broad. The anterior margin is broadly rounded and not produced forward in a snout-like lip as in *C. senaria* Conrad and *C. vogdesi* Foerste. The encroachment of the glabella on the anterior thickened margin is typical of the Silurian and is best developed in *C. breviceps* Raymond, in which the marginal furrow is almost obliterated.

Horizon and Locality. Very rare, exact horizon not known, but probably in the Stonehouse formation, zones a to c, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5584, 5587.

Calymene tuberculosa (Dalman)

Plate XXVI, figures 3, 4

1826. *Calymene blumenbachii* var. *tuberculosa* Dalman, Vet. Ak. Handl., p. 227.
1854. *Calymene tuberculata* Angelin, pp. Pal. Scand., p. 29, tab. 19, Fig. 5 d.
1885. *Calymene tuberculosa* Lindström, Ofvers Vetensk. Acad. Förhandl., p. 66, Tafl. 16, Fig. 8.

Compared with *Calymene tuberculata* Brünnich, this species is smaller, and the extremities of the axial thoracic segments are modified into very prominent tubercles. Lindström has recently shown that a feature of taxonomic value is the direction of the facial suture, especially the manner in which it cuts across the marginal rim of the cheeks in the genal angle. In *C. tuberculata* it does not cut directly across, but is deflected posteriorly for a short distance; specimens in the Yale collections from Gotland exhibit this, as do also the Arisaig specimens. Both the Arisaig and Gotland specimens have a somewhat arched anterior margin in front of the glabella, but it is not produced forward as a snout-like lip as in *C. tuberculosa* Salter. The glabella is close to the anterior rim, and there is only a narrow marginal furrow between.

Total length, 35 mm.; total width, 20 mm.
Length of cephalon, 7 mm.; width, 20 mm.
Length of pygidium, 6 mm.; width, 11 mm.

Horizon and Locality. Very rare in the Beechhill (?) and very rare in zone b of the Ross Brook formation, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 5585, 5586.

Calymene intermedia var. *antigonishensis* n.var.

Plate XXVI, figures 5 to 11

1860. *Calymene blumenbachii* var. Hall, Can. Nat. Geol., 5, p. 156.
1868. *Calymene blumenbachii* var. Dawson, Acad. Geol., 2d. ed., p. 607.
1892. *Calymene blumenbachi* Ami, Trans. N.S. Inst. Sci., ser. 2, p. 192.

Species Reference:

1885. *Calymene intermedia* Lindström, Ofvers Vetensk. Akad. Förhandl., 1885, p. 71, t. 15, Figs. 5-12.
1890. *Calymene intermedia* J. F. Pompecki, Trilobitenfauna der Ost-und Westpreussischen Diluvial-geschiebe, p. 41, t. 6, Fig. 20.
1894. *Calymene intermedia* Schmidt, Rev. Ostbalt, Sil. Trilobiten, p. IV, p. 16, t. 2, Figs. 1-3.

The most important characteristics of the species lie in the relation of the glabella to the anterior thickened margin. Compared with *Calymene tuberculata* Brünnich, the glabella does not extend forward so near to the marginal rim, but is separated from it by a broad, not a narrow, furrow. The anterior margin is not produced forward in a snout-like lip as in *Calymene senaria* Conrad or *C. vogdesi* Foerste, but is broadly and evenly rounded.

The Arisaig specimens referred to var. *antigonishensis* n.var., have the broad marginal furrow and broadly rounded anterior margin of the species. They are, however, much larger than the species, and the thickened margin narrows perceptibly opposite the glabella, where it is cut into by the marginal furrow. This allows the furrow to maintain its width anterior to the glabella without the arching forward of the anterior margin. *C. blumenbachi* var. *a* Salter is a form of *C. intermedia* Lindström and like the Arisaig variety is larger. The illustrations of var. *a* do not show any narrowing of the marginal rim. A single specimen from Arisaig has a proportionately higher and narrower glabella than the other specimens, in which the lateral lobes are directed somewhat obliquely anteriorly; the marginal furrow is yet wider and the anterior margin a little more convex opposite the glabella than in the other specimens; this specimen resembles Reed's Figure 13 of *C. blumenbachi*. None of the specimens of the thorax show the axial thoracic segments modified into nodules or tubercles at the extremities. The pygidium exhibits the bifid (at the extremities) ribs.

Cephalon, 39 mm. wide, 18 mm. high
Pygidium, 38 mm. wide, 23 mm. high

Horizon and Locality. Very rare in zone b of the McAdam (?), rare in zone a of the Moydart, rare in zone a and common in zones b to d of the Stonehouse formation, coast and Stonehouse Brook sections, Arisaig, N.S.

Types. Victoria Memorial Museum; paratypes, Cat. Nos. 5588, 5589, 5590: Peabody Museum of Yale University; holotype, Cat. No. 470b, paratypes 470, 470a, 470c.

Genus, *Homalonotus* Koenig

1825. *Homalonotus* Koenig, Icones Foss. Sectiles, p. 7.
1865. *Homalonotus* (Section Koenigia) Salter, Mon. Brit. Tril., Pal. Soc., pp. 103, 104, 119.
1913. *Homalonotus* Raymond, Zittel-Eastman Textb. Pal., 2d. ed., p. 724.
1918. *Homalonotus* (*Koenigia*) Reed, Geol. Mag., n. ser. (6), 5, 1918, p. 323.

Calymenidae having a short, wide cephalon; glabella broad, depressed, and non-lobate; cheeks rise in high mounds which carry the eyes; axial lobe of thorax broad and gently arched; pleural lobes abruptly deflected ventrally. Genotype, *Homalonotus knighti* Koenig.

Homalonotus knighti Koenig
Plate XXVI, figures 12, 13

1825. *Homalonotus knighti* Koenig, Icones Foss. Sectiles, Pl. 7, fig. 85.
1837. *Homalonotus knighti* Murchison, Sil. Syst., Pl. 7, figs. 1 and 2.
1837. *Homalonotus ludensis* Murchison (part), Sil. Syst., Pl. 7, fig. 3, non. fig. 4.
1865. *Homalonotus knighti* Salter, Mon. Brit. Tril., Pal. Soc., p. 119, Pl. 12, figs. 2 to 10; Pl. 13, fig. 8.

Salter's Description. "The form is oblong, pointed behind, and abruptly truncate in front, the head being nearly a parallelogram, twice and a half as wide as long, and divided by the distinct axial furrows into three nearly equal parts. The glabella is urceolate, a good deal widest below, where it is wider than the cheeks, and rather abruptly contracted half-way up; the front is straight-truncate, and slightly emarginate. The cheeks, separated by broad axial furrows, are decidedly gibbous, the greatest convexity towards the front in advance of the eye, which is placed two-thirds up the cheek and not quite half-way out. It is small, oval, prominent, and subtended by a flattened base. The facial suture runs nearly direct to the front margin from the eye, and beneath it turns abruptly outwards, gaining the outer margin considerably in advance of the facial suture . . . . Neck-furrow strong and broad, but not reaching the angle. No outer marginal furrow to the gibbous cheek.

"The front margin is of most singular structure, and may be described as tricuspid. The narrow edge is so deeply indented, and at the same time folded, that the front portion overhanging the vestral shield (Fig. 2 b) forms one projecting angle, flanked by two smaller projections opposite the axal-furrows, exactly like the salient and re-entering angles of a fortification.

"The vestral shield . . . is pointed in front. But the labrum . . . is a flattened quadrate plate, deeply bilobed at the apex, and with parallel sides, no lateral wings, a convex centre separated from the margin by a shallow furrow; and with a pair of lateral tubercles well developed . . .

"The thoran-rings are convex on the back, but descend so abruptly at the sides as to give a square appearance to the body . . . . The axial furrows are but very slightly marked . . . .

"The pleural groove is narrow externally, very deep and strong on the inner surface . . . . The pleuræ are strongly granular, the granules taking the form of closely placed squamæ over the whole surface.

". . . The shape of the tail is truly triangular, as wide as long, contracted near the apex, and then pointed, the tip somewhat recurved. The axis is rather narrow, and not much distinguished from the sides, the furrows being quite continuous across. There are eight of them, the upper not stronger than the rest; and all are deep furrows, only rather less broad than the intervening ridges. . . .

"The eight furrows abruptly cease at rather beyond half-way down the tail; on the sides they cease entirely; on the axis there are one or two faint ribs beyond them. The incurved under margin of the tail is very remarkable. It is sharply incurved, strongly concave, and roughly granular, and there is besides a strong lateral contraction about half-way down the tail."

The most important diagnostic features of this species lie in the pygidium. All specimens from the McAdam and Moydart formations exhibit the contracted, produced, and somewhat recurved apex. A little more than half of the anterior surface is modified by seven or eight continuous furrows separating raised rib-like ridges, beyond which are two or three faint furrows confined to the axis. In one large specimen the pygidium is a little longer and more tapering than in most specimens. Only two specimens of the cephalon are known; they are similar to *Homalonotus dawsoni* Hall.

Cephalon, 70 mm. wide, 28 mm. high
Pygidium, 22 mm. wide, 22 mm. high
Pygidium, 30 mm. wide, 35 mm. high

Horizon and Locality. Very rare throughout the McAdam and common in zone a of the Moydart, coast and Ross Brook sections, Arisaig, N.S.

Type. Victoria Memorial Museum; plesiotype, Cat. No. 6209.

Homalonotus dawsoni Hall

Plate XXVI, figures 14, 15; Plate XXVII, figures 11 to 16

1860. *Homalonotus dawsoni* Hall, Can. Nat. Geol., 5, p. 155, Fig. 17.
1868. *Homalonotus dawsoni* Dawson, Acad. Geol., 2d. ed., p. 606, Fig. 214.
1877. *Homalonotus dawsoni* Dawson, Geol. Mag. (2), 4, p. 57, Fig. 2.
1878. *Homalonotus dawsoni* Dawson, Acad. Geol., 3d. ed., p. 606, Fig. 214.
1892. *Homalonotus dawsoni* Ami, Trans. N.S. Inst. Sc., ser. 2, 1, p. 192.
1913. *Homalonotus dawsoni* Bassler, Bull. U.S. Nat. Mus., 92, p. 632.

Original Description. "Caudal shield somewhat parabolic, obtuse at the extremity, very convex, width at the anterior side greater than the length of the axis. Axis wider than the lateral lobes, distinguishable (in casts) from the lobes by a bending of the ribs and a scarcely perceptible depression along that line; annulations abruptly prominent; seven on the lateral lobes and nine on the axis, the anterior ones bending slightly backward at the line of division between the axis and the lateral lobe; each successive one bending more and more abruptly until the last one approaches a rectangular turn; the whole curving gently forward at their extremities, and all terminating abruptly before reaching the margin. Behind the seventh annulation the axis is marked by two more annulations, leaving nearly one-fourth of its length smooth.

" . . . An impression of a few imperfect annulations of the body shows that they are strongly elevated, much more so than in any known American species."

In 1868 Dawson described the cephalon:

"It has the posterior border nearly straight, the glabella moderately prominent and slightly wider behind than before. It descends abruptly in front, and the frontal margin appears to have risen with equal abruptness in front of the glabella and eyes. The eyes are large and prominent, and advance into a line with the front of the glabella. Some specimens have the head nearly 3 inches broad."

In 1877 Dawson described an almost complete specimen from East river, Pictou county.

"The specimen is a cast of the inner surface of the crust, so that the deep transverse furrows are not the margins of the segments, but the impressions of their strong internal ridges. The ends of the pleuræ are bent down abruptly at right angles to the back, giving it a very narrow appearance when viewed from above; but this may be partly a result of distortion, in connexion with the slaty cleavage which has affected the rock. Still, from the great width of the segments, the thorax is of great length, in comparison with the cephalic shield and pygidium, and this seems to be one of the distinctive characters of the species. The caudal shield, as described by Prof. Hall, has, in all, nine annulations; of which in this specimen two, as well as the smooth extremity of the shields, have been broken off. The impression of the external surface, seen on the matrix, shows that the axis of the thoracic segments was marked with scattered tubercles. The cephalic shield and pygidium appear to have been minutely granulate. On a portion of the latter these granulations have a scaly form, as in some other species of the genus. The ends of the pleuræ are broad and rounded."

"This fine species is evidently a close ally of *H. knightii* of the English Ludlow, though it differs considerably in details of structure."

The pygidium is readily distinguished from that of *Homalonotus knighti* Koenig. The smooth portion is confined to about one-quarter of the posterior surface, the apex is not produced or recurved, but rather abruptly rounded off. The basal margin curves upward somewhat, near the apex. It is proportionately a little wider than *H. knighti.* The pygidium resembles that of *H. ludensis* Murchison[1] (non Salter), Figure 3, non 4.

On the cephalon the cheeks, which rise in a prominent mound and bear the eyes, somewhat overhang the antero-lateral margins. The anterior margin is not well preserved, but is produced in an upwardly curved plate-like process. Whether this is flanked on either side by smaller projections as in *H. knighti*[1] is not known. The axis of the thorax is broadly arched and has a broad, shallow depression on either side.

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[1] Murchison's Sil. Syst., Pl. 7, fig. 3, non. 4.

Total length 90 mm., width 50 mm.
Cephalon, length 20 mm., width 50 mm.
Pygidium, length 17 mm., width 20 mm.
Several cephalons are 35 mm. high and 80 mm. wide
One cephalon is 45 mm. high and 105 mm. wide
Many pygidia are 28 mm. high and 32 mm. wide

Horizon and Locality. Rare in zone b and very common in zone c of the Stonehouse formation, coast section, Arisaig ,N.S.

Types. Peabody Museum of Yale University; plesiotypes, Cat. Nos. 471, 474, 474a, 474b.

Family, PHACOPIDAE Corda
Subfamily, **Dalmanitinae** Reed
Genus, *Dalmanitina* Reed

1843. *Acaste* Goldfuss (not Leach) (part) Neues Jahr. Min., etc., 1843, p. 563.
1845. *Dalmania* Emmrich (not Desvoidy) (part), Neues Jahr. Min., etc., 1845, p. 40.
1852. *Dalmania* Barrande (part), Syst. Sil. du Centre Bohême, 1, p. 528.
1852. *Dalmanites* Barrande (part), Syst. Sil. du Centre Bohême, 1, p. 934.
1864. *Acaste* Salter, Mon. Brit. Tril., Pal. Soc., 1864, p. 14.
1905. *Dalmanitina* Reed, Geol. Mag. (5), 2, p. 224.
1905. *Phacopidella* Reed (part), Geol. Mag. (5), 2, p. 173.
1906. *Phacopidella* Reed, Lower Pal. Tril. Girvan, pt. III, Pal. Soc., p. 156.
1913. *Dalmanitina* Raymond, Zittel-Eastman Textb. Pal., 2d. ed., p. 726.
1913. *Phacopidella* Raymond (part), Zittel-Eastman Textb. Pal., 2d. ed., Fig. 1409.
1918. *Dalmanitina* McLearn, Ottawa Nat., 32, May, 1918, p. 32.

This genus embraces the primitive, generalized line of the family Phacopidae and ranges from the Ordovician into and throughout the Silurian. The generic characters are: well-marked pentamerism of the glabella, no semi-detachment of the frontal lobe, genal angles rounded off or only produced into short spines, pygidium has few segments and is rounded posteriorly or rarely produced in a short mucronation. It includes *Dalmania socialis* Barrande, *Calymene downingiae* Murchison, *Phacops* (*Acaste*) *constricta* Salter, and *Dalmanitina logani* var. *conservatrix* McLearn. The Ordovician *P. apiculata* (Salter) apparently also belongs here. Genotype, *Dalmania socialis* Barrande.

D. logani Hall departs from the typical structure of the genus in the obsolescence of the anterior furrows of the glabella. Since, however, it exhibits all gradations with a form typical of the genus *D. logani* var. *conservatrix* McLearn, it is retained under *Dalmanitina*.

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[1] Op. cit., p. 120.

Dalmanitina logani (Hall)
Plate XXVII, figures 3 to 6

1860. *Dalmania logani* Hall, Can. Nat. Geol., 5, p. 156, Fig. 18.
1868. *Dalmania logani* Dawson, Acad. Geol., 2d. ed., p. 608, Fig. 215.
1892. *Dalmania logani* Ami, Trans. N.S. Inst. Sci., ser. 2, 1, p. 192.
1915. *Dalmanites logani* Bassler, Bull. U.S. Nat. Mus., 92, p. 385.

Original Description. "The specimens are two or three imperfect cephalic shields, one preserving the palpebral lobes, and others consisting principally of the glabella, with two or three parts of caudal shields. There is a fragment of a cheek which may be of this species. Cephalic shield somewhat semicircular, glabella ovate, wider in front and truncate behind, depressed convex; occipital ring narrow, prominent; occipital furrow bending a little forward in the middle and curving gently backward in the middle of each side, and again turning forward; posterior furrows narrow and sharply impressed, each one extending about one-third across the glabella and curving forward at their outer extremities; central furrow linear, obscure, having a direction transverse to the axis, linear, extending to the margin of the glabella a little forward of the eye; frontal lobe regularly rounded anteriorly. A fragment of a cheek in the same association is broad, produced posteriorly in a short strong spine, and marked by a broad sub-marginal groove. Caudal shield somewhat semi-elliptical, convex, acute behind, axis very prominent, rounded and marked by about eight annulations, which are gently curved backward at the extremities; lateral lobes with six simple flattened ribs which terminate in a thickened border, and separated from the axis by a strongly defined furrow; extremity abruptly pointed.

"The glabella of this species more nearly resembles *Phacops* in the general form and faintly impressed furrows, of which the posterior one is conspicuous. The form of the palpebral lobe, and the absence of tubercles at the base of the glabella, together with the form of the caudal shield, ally it with *Dalmania,* and it may be compared with *D. phillipsi* of Barrande, but has a more pointed caudal shield, and the cheek, if correctly referred, is prolonged in a posterior spine."

This species exhibits much more variation than Hall describes. The fixed cheek is much larger than Hall's figure suggests, and the facial suture emerges above the genal angles as in all Proparia. The continuous furrow above the occipital furrow of Hall's figure does not exist. The third pair of glabella lateral furrows are strongly impressed. The anterior and middle pair are faintly developed or obsolete. All stages exist between it and specimens in which all the furrows are well developed. These have been described as *Dalmanitina logani* var. *conservatrix* McLearn. On the pygidium, the mucronate extension of the apex varies somewhat, but is in all specimens short. The rings of the axis become smaller and more closely set posteriorly and the axis tapers somewhat. The genal spine, described by Hall, is not observed in any of the specimens studied.

Compared with *D. downingiae* (Murchison), this species is larger, the first two pairs of glabella furrows are obsolete or obsolescent, the third pair of lateral glabella lobes are slightly smaller, on the average, the pygidium is mucronate, and the axis proportionately more slender and tapering. A few specimens show a somewhat tuberculose surface of the glabella. In *D. solitaria* (Barrande), the outline of the glabella is the same, the anterior glabella furrows are variably obsolescent and the glabella surface is somewhat tuberculose; the mucronation on the pygidium is longer, however, and the ribs of the pleural lobes more distinctly divided by a median furrow. The pygidium of *D. phillipsi* (Barrande) has no mucronate extension.

The cephalon is a little more than twice as wide as high. The maximum width is about 22 mm. The pygidium varies somewhat, but is usually wider than long; width 13 mm., length 8 mm.

Horizon and Locality. Rare in zones a and b and very common in zone c of the Stonehouse formation, coast section, Arisaig, N.S.

Types. Victoria Memorial Museum; plesiotypes, Cat. Nos. 6210, 6211, 5998: Peabody Museum of Yale University; plesiotype, Cat. No. 481.

Dalmanitina logani var. *conservatrix* McLearn

Plate XXVII, figures 1, 2

1918. *Dalmanitina logani* var. *conservatrix* McLearn, Ottawa Nat., 32, May 1918, p. 33.

Original Description. "This variety only differs from *Dalmanitina logani* (Hall) by having all the glabella furrows well impressed, but all gradations exist between them. Compared with *Dalmanitina downingiae* (Murchison) the frontal lobe is a little higher, the third side lobes slightly smaller, and the glabella surface variably tuberculose. The pygidium is mucronate and with a proportionately more slender and tapering axis. The cephalon is a little more than twice as wide as high. The maximum width is about 22 mm. The average pygidium is 13 mm. wide and 8 mm. long."

Horizon and Locality. Very rare in zone a of the Moydart and rare in zones a to c of the Stonehouse, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 472: Victoria Memorial Museum; paratype, Cat. No. 5999.

Genus, *Dalmanites* Barrande

1852. *Dalmanites* Barrande (part), Syst. Sil. du Centre Bohême, 1, p. 934.
1905. *Dalmanites* Reed, Geol. Mag. Lond., 5, 2, p. 224.
1913. *Dalmanites* Raymond, Zittel-Eastman Textb. Pal., p. 726.

Dalmanitinids having well-developed pentamerism of the cephalon and detached frontal lobe of the glabella; genal angles produced in spines and pygidium mucronate; the latter is of many segments, always more than 10.

The species below referred to this genus is intermediate between it and the composite genus *Dalmanitina* Reed. It occurs in the early Silurian, when *Dalmanites* first appears and when a connecting form might be expected. It possesses the detached frontal lobe and rather numerous pygidial segments, but is lacking in the other diagnostic characters. Genotype, *Trilobus caudatus* Brünnich.

Dalmanites weaveri (Salter)
Plate XXVII, figures 7 to 10

1849. *Phacops* sp. Salter, Decades Geol. Surv., 2, art. 1, p. 7, Fig. 16.
1865. *Phacops weaveri* Salter (part), Mon. Brit. Tril., Pal. Soc., p. 57, non text fig. 15; Pl. 3, fig. 1, figs. 2, 3; Pl. 4, figs. 6-7, non 8, 9.
1909. *Dalmanitina weaveri* Reed, Geol. Mag. Lond., 5, 6, pp. 69-73.

Original Description. "Length of tail 1½ inches. There are but imperfect heads in the collections of the Geological Society and Geological Survey. The characters of the tail distinguish it from *P. caudatus;* it has much more numerous ribs, which are but little curved, and not duplicate; the margin, too, is equal all round, not expanded or mucronate at the end. Young specimens have not the full number of ribs, and a few of the upper ones are slightly divided. The most prominent analogy is with *P. hausmanni* Brongn.; but that is strongly tuberculate, almost spinous, all over. *P. pleuroptyx* (Green), is also like, but has the lateral ribs duplicate. . . . Should it prove new, it might be called *P. weaveri.*"

Reed's Description. "The head-shield from Long's quarry . . . which Salter figured in his monograph in Pl. iii, fig. 1, is imperfect on the left side. Its length is about 14 mm., of which the frontal lobe of the glabella accounts for 8 mm.; this lobe is 12 mm. in width and projects a little laterally, and has a well-marked elongated pit in the median line, as Salter represented in his figure, but did not mention. The first lateral lobe has a somewhat greater length along the axial furrow than Salter's figure shows. The second and third lateral lobes are of equal size. The first lateral furrow curves inward at about 50 degrees-60 degrees, and the second and third lateral furrows, which are parallel to each other, at about 70 degrees-75 degrees to the axial furrows. The eye-lobes are rather larger and longer and the eyes rather less curved and rather nearer the glabella than in typical examples of *Ph. caudatus,* but except in these details there does not appear to exist any marked difference." Reed, page 71.

"Shape [of pygidium] parabolic, wider than long, rounded behind, not mucronate; border smooth, of subequal width all round, not produced into a point. Axis conical, tapering regularly at about 20 degrees-25 degrees to obtuse tip, annulated for whole length, with eight complete strong rings corresponding to the ribs, followed by 4-7 much narrower weaker rings. Lateral lobes gently convex and arched down, composed of 8 slightly curved ribs, successively decreasing in size posteriorly and the last pair subparallel, marked by fine submedian furrow for greater part of length, separated by narrow interpleural furrows, ribs and furrows ending abruptly inside border." Reed, page 73.

The Arisaig specimens have the non-mucronate pygidium and the ribs of the lateral lobes are not strongly divided. As this species stands intermediate between *Dalmanitina* Reed and *Dalmanites* Barrande, it can best be described by comparing it with *Dalmanitina downingiae* Murchison and *Dalmanites caudatus* Brünnich. The following is based on Arisaig specimens:

Compared with *Dalmanitina downingiae* Murchison, this species is larger, the anterior pair of furrows on the glabella are somewhat deeper and broader, the pygidium is proportionately a little longer, the axis of the pygidium is more slender and tapering and bears more segments, about 12, which become smaller and fainter posteriorly. *D. downingiae* bears about 8 on the axis of the pygidium. The pleural lobes of the pygidium bear 8 ribs, curving a little posteriorly and rapidly becoming shorter towards the apex of the pygidium. *D. downingiae* has about 6. The outline and the slender tapering axis of the pygidium resemble *D. caudatus* (Brünnich). The latter, however, has more segments in the axis of the pygidium and the ribs on either side are bifurcated into a larger and finer one. In *D. weaveri* the apex of the pygidium is not mucronate; the smooth marginal border of the pygidium, instead of broadening in a mucronate extension, is slightly more narrow there. The better developed anterior pair of glabella furrows also resemble those of *D. caudatus*, but are not so well-marked as in that species. The surface of the glabella is not so strongly tuberculose as in *D. caudatus*. The genal angle is not produced in a spine.

Horizon and Locality. Common in zones d and e of the Ross Brook formation, coast section, Arisaig, N.S. Present also in the Mayhill sandstone of Charfield and Tortworth, England.

Types. Peabody Museum of Yale University; plesiotypes, Cat. Nos. 473 to 473c.

Dalmanites sp.

Plate XXVIII, figure 5

A small pygidium of a trilobite occurs in the strata just above the iron ore bed. It is thought to be of this genus. It is mucronate.

Horizon and Locality. Very rare in zone a of the McAdam formation, Arisaig brook, Arisaig, N.S.

Type. Peabody Museum of Yale University; Cat. No. 482.

Subfamily, Phacopinae Reed

Genus, *Phacops* Emmrich

Subgenus, *Portlockia* McCoy

1839. *Phacops* Emmrich (part), De Trilob. Dissert., p. 18.
1843. *Phacops* Goldfuss (part), Neues Jahr. Min., etc., 1843, p. 564.
1845. *Phacops* Emmrich (part), Neues Jahr. Min., etc., 1845, p. 38.
1846. *Portlockia* McCoy (part), Sil. Fossils Ireland, p. 50.
1852. *Phacops* Barrande (part), Syst. Sil. du Centre Bohême, 1, p. 498.
1864. *Phacops* Salter (part), Mon. Brit. Tril., Pal. Soc., p. 14.
1906. *Phacopidella* Reed (part), The Lower Palæozoic Tril. Girvan, pt. III, Pal. Soc., p. 154.
1911. *Phacops* Wedekind (part), Zeitschr. Deutsch. Geol. Ges., 63, p. 317.
1918. *Portlockia* McLearn, Ottawa Nat., 32, May, 1918, p. 34.

The Silurian progenitors of Devonian *Phacops* Emmrich s. str., embraced by the subgenus *Portlockia* McCoy, compared with the later species, are of smaller size, have a poorer development of tuberculose surface, particularly of the glabella, and a much more depressed, never overhanging, anterior surface of the glabella. Genotype, *Calymene stokesi* Milne-Edwards.

Phacops (*Portlockia*) *marklandensis* McLearn
Plate XXVIII, figures 1 to 4

1918. *Phacops* (*Portlockia*) *marklandensis* McLearn, Ottawa Nat. 32, May, 1918, p. 35.

Original Description. "Compared with *Phacops* (*Portlockia*) *elegans* (Sars and Boeck) this species has a still more reduced basal (third side pair) lobe and smaller tubercles at its extremities. It differs in a similar manner from *P.* (*Portlockia*) *stokesi* (Milne-Edwards) and in addition in the presence of well-developed, although not highly elevated, tubercles at the extremities of the thoracic axial segments. Compared with *P.* (*Portlockia*) *orestes* (Billings), the basal lobe and tubercle are much more reduced, the thoracic-axial tubercles are more strongly developed, and the axial segments relatively more slender. The glabella is somewhat depressed, with first pair of side furrows short and weakly impressed. The second pair are short, weakly impressed, and almost straight. The pygidium has four pairs of ribs on the pleural lobes, divided distally by a median sulcus. The fourth pair are faint. The axis of the pygidium is divided into about eight rings."

Dorsal shield, width 14 mm., length 20 mm.
Cephalon, width 14 mm., length 6 mm.
Pygidium, width 9 mm., length 5 mm.

Horizon and Locality. Very rare in zone b of the Ross Brook, coast section, Arisaig, N.S.

Types. Peabody Museum of Yale University; holotype, Cat. No. 483: Victoria Memorial Museum; paratype, Cat. No. 6001.

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PLATE I

Heliophrentis bilateralis var. *beechhillensis* n. var. (Page 31.)

FIGURE 1. Side view of mould of exterior. Note calice, false columella, and fossula. Vict. Mem. Mus., Cat. No. 6004, holotype.
FIGURE 2. Section. Note fossula. Vict. Mem. Mus., Cat. No. 6006, paratype.
FIGURE 3. Mould of calice. Note projecting mould of fossula and denticulations. Vict. Mem. Mus., Cat. No. 6005, paratype.

Monograptus clintonensis (Hall). (Page 34.)

FIGURE 4. Peabody Mus., Yale Univ., Cat. No. 402, plesiotype.
FIGURE 5. Peabody Mus., Yale Univ., Cat. No. 403, plesiotype.
FIGURE 6. Peabody Mus., Yale Univ., Cat. No. 404, plesiotype.

Monograptus wandalensis Watney and Welch. (Page 35.)

FIGURE 7. Peabody Mus., Yale Univ., Cat. No. 405, plesiotype.

Retiolites geinitzianus mut. *venosus* (Hall). (Page 34.)

FIGURE 8. Peabody Mus., Yale Univ., Cat. No. 401, plesiotype.

Conularia honeymani n. sp. (Page 38.)

FIGURE 9. Vict. Mem. Mus., Cat. No. 3143, holotype.
FIGURE 10. The same specimen X 5; shows ornamentation.

Favosites cf. niagarensis Hall. (Page 32.)

FIGURE 11. Vict. Mem. Mus., Cat. No. 6003, holotype.

Serpulites longissimus Sowerby. (Page 36.)

FIGURE 12. Vict. Mem. Mus., Cat. No. 6212, plesiotype.

Conularia twenhofeli n. sp. (Page 37.)

FIGURE 13. Vict. Mem. Mus., Cat. No. 6008, holotype.
FIGURE 14. The same specimen. Side view.

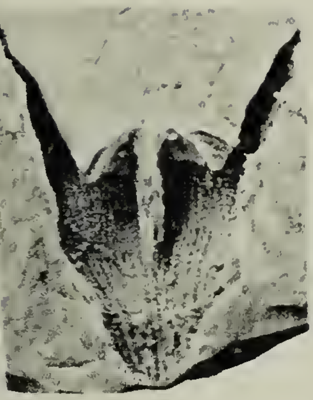
Conularia antigonishensis n. sp. (Page 38.)

FIGURE 15. Peabody Mus., Yale Univ., Cat. No. 406, holotype.

Conularia twenhofeli n. sp. (Page 37.)

FIGURE 16. Peabody Mus., Yale Univ., Cat. No. 407, paraplastotype. See Pl. XXVIII, fig. 9, for enlargement of surface.

Plate No. I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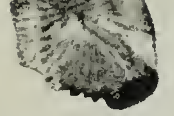
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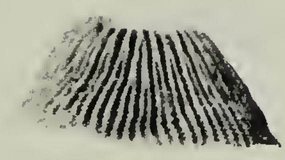
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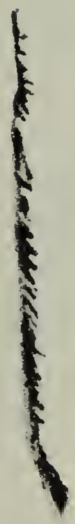
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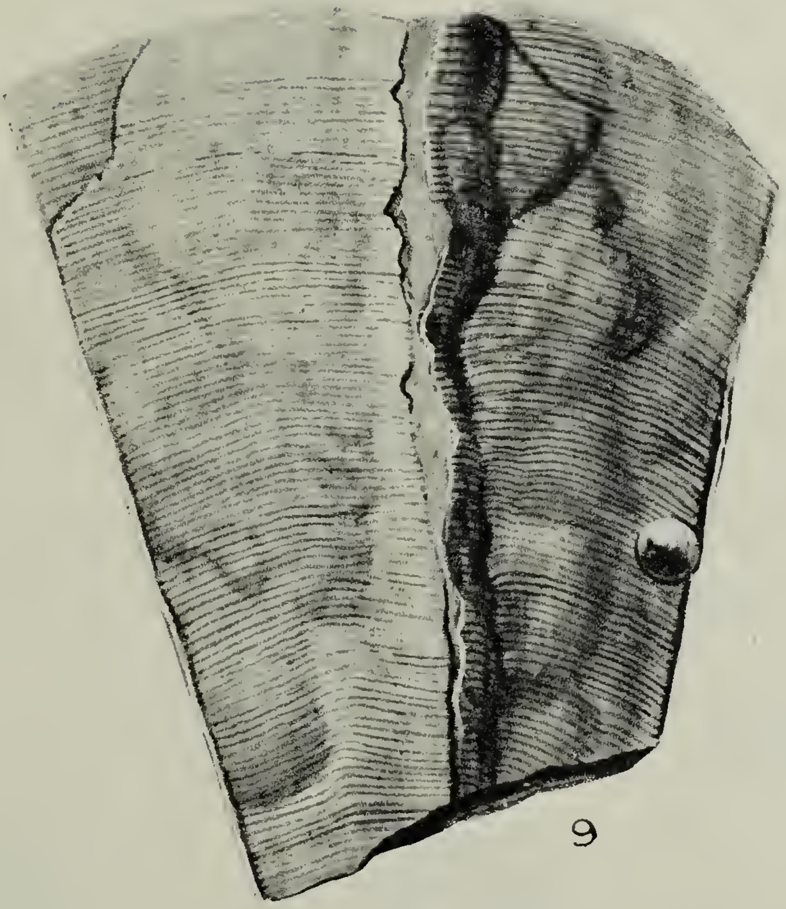
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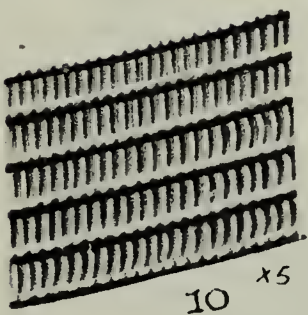
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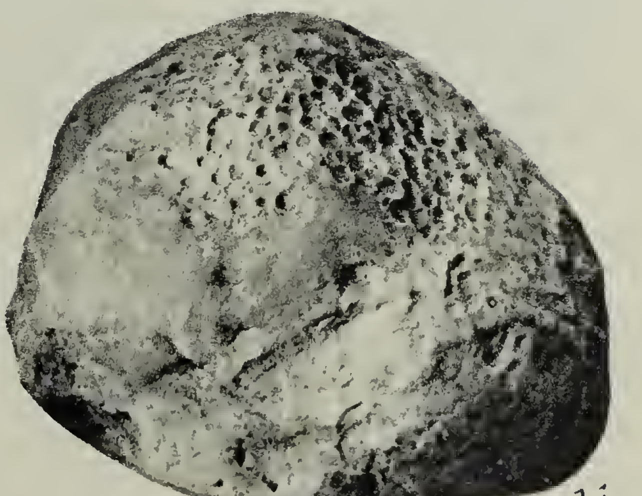
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PLATE II

Lingula subacutirostris n. sp. (Page 44.)

FIGURE 1. Peabody Mus., Yale Univ., Cat. No. 408, holotype.

Lingula clintoni Vanuxem. (Page 43.)

FIGURE 2. Peabody Mus., Yale Univ., Cat. No. 409, plesiotype.

Lingula subacutirostris n. sp. (Page 44.)

FIGURE 3. Vict. Mem. Mus., Cat. No. 6197, paratype.

Lingula minima Sowerby. (Page 44.)

FIGURE 4. Vict. Mem. Mus., Cat. No. 6198, plesiotype.

Lingula lewisi Sowerby. (Page 45.)

FIGURE 5. Peabody Mus., Yale Univ., Cat. No. 410, plesiotype.
FIGURE 6. Vict. Mem. Mus., Cat. No. 6199, plesiotype.

Lingula taeniola Hall and Clarke. (Page 45.)

FIGURE 7. Vict. Mem. Mus., Cat. No. 6200, plesiotype.

Lingula (Palaeoglossa) distornata n. sp. (Page 46.)

FIGURE 8. Vict. Mem. Mus., Cat. No. 6201, holotype.

Schizocrania megumaensis n. sp. (Page 48.)

FIGURE 9. Dorsal valve. Vict. Mem. Mus., Cat. No. 6202, paraplastotype.
FIGURE 10. Exterior of ventral valve, with pedicle notch. Axis of notch out of alignment. Peabody Mus., Yale Univ., Cat. No. 411, holotype.
FIGURE 11. Surface of ventral valve, Peabody Mus., Yale Univ., Cat. No. 412, paratype.

Cornulites serpularius Schlotheim. (Page 39.)

FIGURE 12. Large specimen. Vict. Mem. Mus., Cat. No. 6010, plesiotype.
FIGURE 13. A more slender specimen. Vict. Mem. Mus., Cat. No. 6009, plesiotype.
FIGURE 14. A curved, slender specimen. Peabody Mus., Yale Univ., Cat. No. 413, plesiotype.

Cornulites subdistans n. sp. (Page 40.)

FIGURE 15. Peabody Mus., Yale Univ., Cat. No. 414, paratype.
FIGURE 16. Peabody Mus., Yale Univ., Cat. No. 415, holotype.
FIGURE 17. Annuli farther apart than in preceding specimens. Peabody Mus., Yale Univ., Cat No. 416.

Orbiculoidea subplana (Hall). (Page 48.)

FIGURE 18. Exterior of dorsal valve. Vict. Mem. Mus., Cat. No. 6203, plesioplastotype.
FIGURE 19. Interior of ventral valve with pedicle furrow and tubular sipho. Peabody Mus., Yale Univ., Cat. No. 417, plesiotype.
FIGURE 20. Enlargement of surface of specimen, fig. 18. Radiate structure probably due to slight weathering of surface.

Orbiculoidea novascotica (Ami). (Page 49.)

FIGURE 21. Dorsal valve. Vict. Mem. Mus., Cat. No. 6204, lectotype.
FIGURE 22. Side view of same.

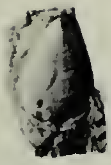
Pholidops acadiensis (Hall). (Page 50.)

FIGURE 23. Exterior. Peabody Mus., Yale Univ., Cat. No. 418, plesiotype. *See* Plate X, fig. 10.

Dalmanella conservatrix n. sp. (Page 52.)

FIGURE 24. Interior ventral valve. Vict. Mem. Mus., Cat. No. 6206, paraplastotype.
FIGURE 25. Exterior ventral valve. Vict. Mem. Mus., Cat. No. 6205, holoplastotype.
FIGURE 26. Exterior dorsal valve. Vict. Mem. Mus., Cat. No. 6207, paraplastotype.

Plate No. II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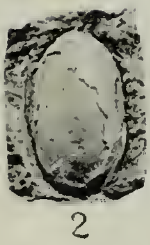
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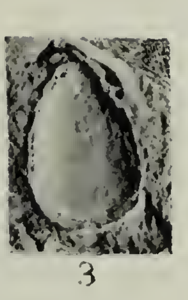
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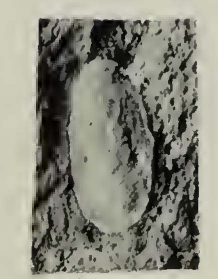
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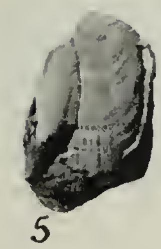
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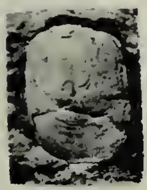
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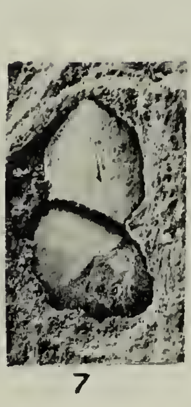
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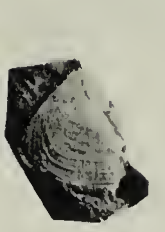
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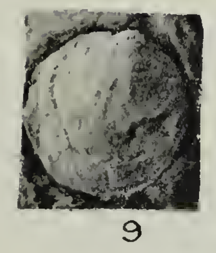
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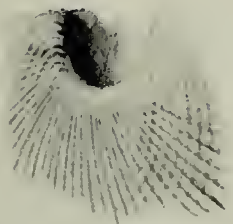
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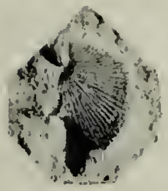
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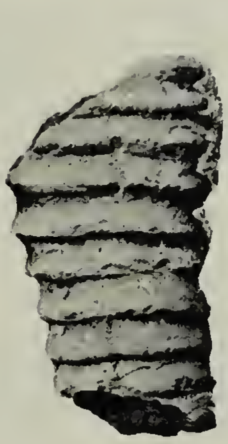
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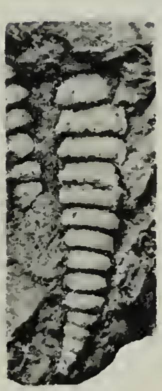
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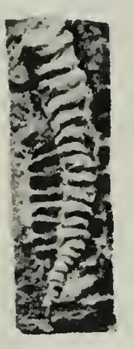
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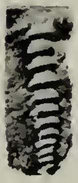
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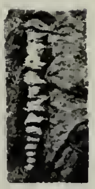
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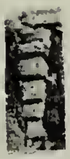
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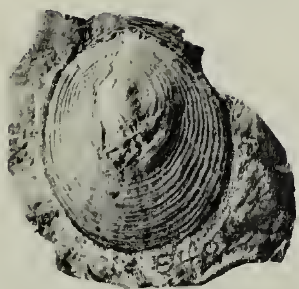
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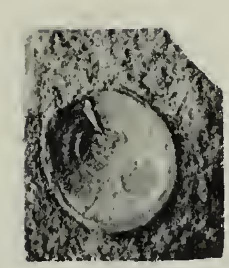
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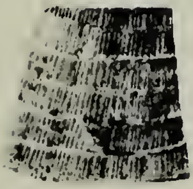
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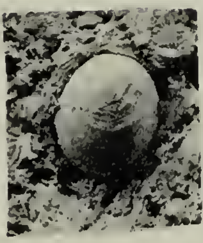
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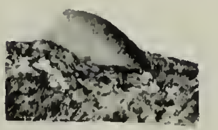
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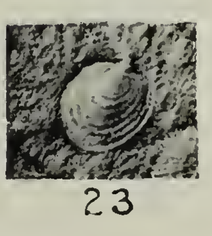
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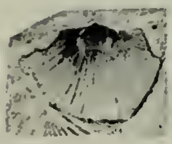
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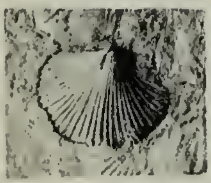
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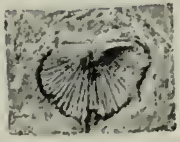
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PLATE III

Mesopalaeaster (?) *parviusculus* (Billings). (Page 41.)

FIGURE 1. Vict. Mem. Mus., Cat. No. 3084, plesioplastotype.
FIGURE 2. The same specimen X 2.

Dalmanella elegantula var. *submedia* n. var. (Page 53.)

FIGURE 3. Mould of interior of dorsal valve. Vict. Mem. Mus., Cat. No. 6208, holotype; Cat. No. 6208a, holoplastotype.
FIGURE 4. The same specimen. Cast of interior of dorsal valve.
FIGURE 5. Dorsal valve. Peabody Mus., Yale Univ., Cat. No. 419, paratype.
FIGURE 6. Ventral valve. Peabody Mus., Yale Univ., Cat. No. 420, paratype.

Dalmanella elegantula mut. *primitiva* n. mut. (Page 53.)

FIGURE 7. Ventral valve, Peabody Mus., Yale Univ., Cat. No. 421, holotype.

Dalmanella elegantula mut. *transversaria* n. mut. (Page 54.)

FIGURE 8. Interior ventral valve. Peabody Mus., Yale Univ., Cat. No. 422, paratype.
FIGURE 9. Exterior of ventral valve. Peabody Mus., Yale Univ., Cat. No. 423, holotype.

Dalmanella wisbyensis var. *nana* n. var. (Page 55.)

FIGURE 10. Ventral view. Peabody Mus., Yale Univ., Cat. No. 424, holotype.
FIGURE 11. The same specimen. Dorsal view.
FIGURE 12. The same specimen. Side view.
FIGURE 13. Interior of dorsal valve. Note strong median septum and striate margin. Peabody Mus., Yale Univ., Cat. No. 424a, paraplastotype.
FIGURE 14. Interior of ventral valve. Peabody Mus., Yale Univ., Cat. No. 424b, paraplastotype.
FIGURE 15. Dorsal view. Peabody Mus., Yale Univ., Cat. No. 424c, paratype.
FIGURE 16. The same specimen. Ventral view.
FIGURE 17. The same specimen. Side view.

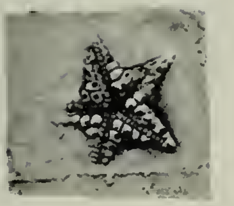
Idiorthis avita n. sp. (Page 57.)

FIGURE 18. Exterior dorsal valve. Peabody Mus., Yale Univ., Cat. No. 425, holotype.

Idiorthis matura n. sp. (Page 57.)

FIGURE 19. Dorsal view. Peabody Mus., Yale Univ., Cat. No. 426, holotype.
FIGURE 20. The same specimen. Ventral view.
FIGURE 21. The same specimen. Side view.
FIGURE 22. Ventral view. Peabody Mus., Yale Univ., Cat. No. 426a, paratype. *See* Pl. XXVIII, fig. 10, for enlargement X 3 of striation.
FIGURE 23. The same specimen. Dorsal view.
FIGURE 24. The same specimen. Side view.

Plate No. III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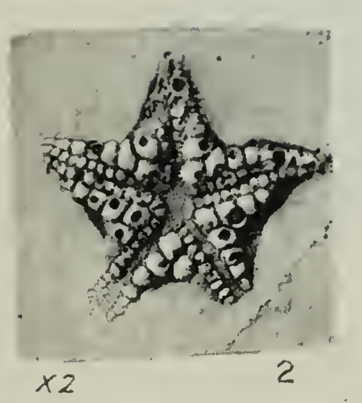
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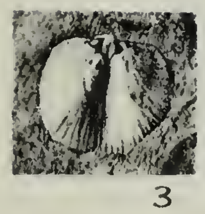
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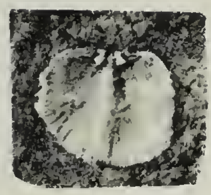
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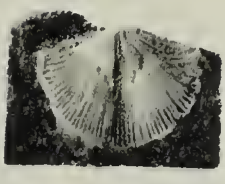
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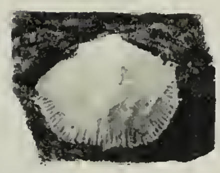
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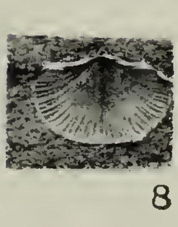
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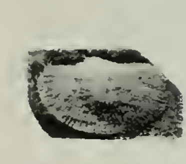
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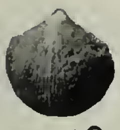
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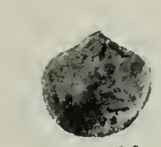
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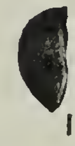
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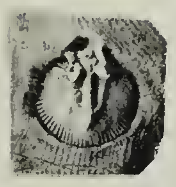
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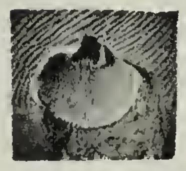
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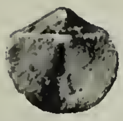
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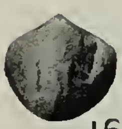
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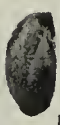
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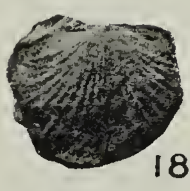
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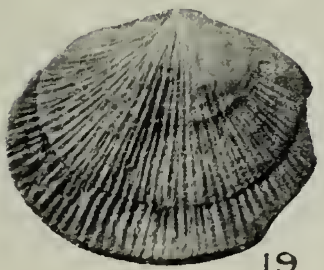
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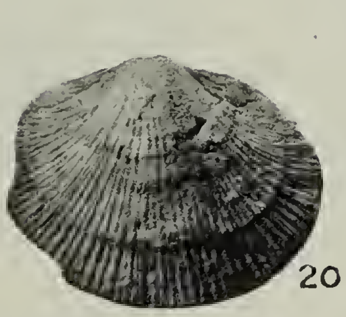
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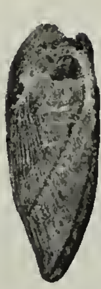
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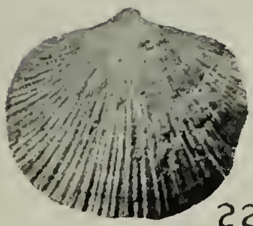
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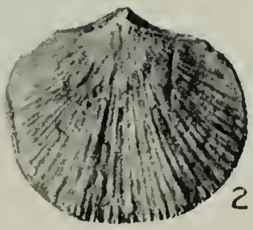
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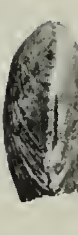
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Plate IV

Idiorthis matura n. sp. (Page 57.)

Figure 1. Interior of ventral valve. Peabody Mus., Yale Univ., Cat. No. 426b1, paraplastotype.
Figure 2. Interior of dorsal valve. Peabody Mus., Yale Univ., Cat. No. 426b2, paraplastotype.
Figure 3. Drawing interior of dorsal valve. Peabody Mus., Yale Univ., Cat. No. 426c, paraplastotype.
Figure 4. The same specimen. Photograph.

Dalmanella lunata (Sowerby). (Page 55.)

Figure 5. Exterior ventral valve. Peabody Mus., Yale Univ., Cat. No. 427, plesiotype.
Figure 6. Mould interior of ventral valve. Vict. Mem. Mus., Cat. No. 5408, plesiotype.

Dalmanella orbicularis (Sowerby). (Page 56.)

Figure 7. Exterior ventral and dorsal valves. Vict. Mem. Mus., Cat. No. 5409, plesioplastotype.

Dalmanella elegantula var. *submedia* n. var. (Page 53.)

Figure 8. Dorsal valve. Peabody Mus., Yale Univ., Cat. No. 428, paratype.

Schizophorella arisaigensis n. sp. (Page 58.)

Figure 9. Exterior ventral valve. Vict. Mem. Mus., Cat. No. 5413, paraplastotype.
Figure 10. Interior ventral valve. Peabody Mus., Yale Univ., Cat. No. 477, holoplastotype.
Figure 11. Interior ventral valve. Vict. Mem. Mus., Cat. No. 5411, paraplastotype.
Figure 12. Interior dorsal valve. Vict. Mem. Mus., Cat. No. 5412, paraplastotype.
Figure 13. Exterior ventral valve. Vict. Mem. Mus., Cat. No 5414, paraplastotype.

Leptaena rhomboidalis (Wilckens). (Page 59.)

Figure 14. Dorsal valve. Vict. Mem. Mus., Cat. No. 5415, plesiotype.

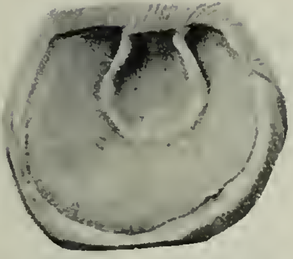
Rafinesquina beechhillensis n. sp. (Page 60.)

Figure 15. Ventral valve. Vict. Mem. Mus., Cat. No. 5416a, holoplastotype.

Brachyprion mertoni n. sp. (Page 61.)

Figure 16. Exterior ventral valve. Vict. Mem. Mus., Cat. No. 5418, paratype.
Figure 17. Interior ventral valve. Vict. Mem. Mus., Cat. No. 5419, paraplastotype, for enlargement X 2. *See* Pl. XXVIII, fig. 12.
Figure 18. Exterior ventral valve. Vict. Mem. Mus., Cat. No. 5417, holotype.

Plate No. IV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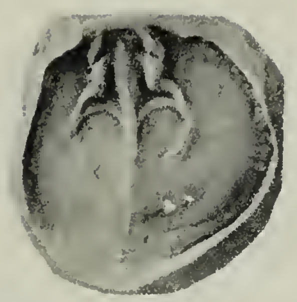
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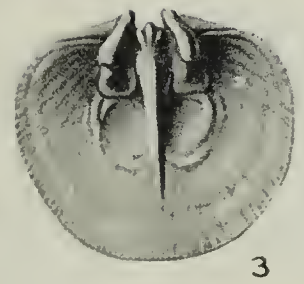
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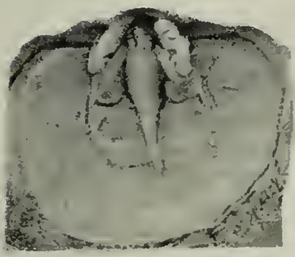
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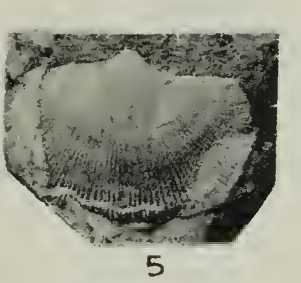
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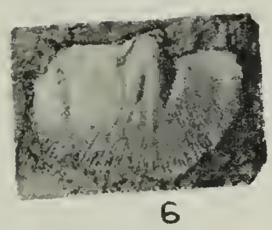
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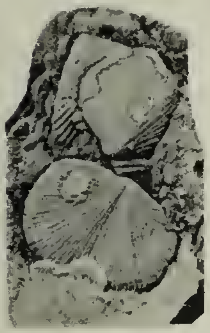
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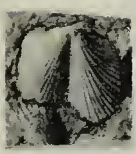
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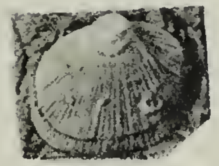
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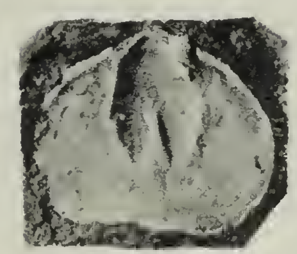
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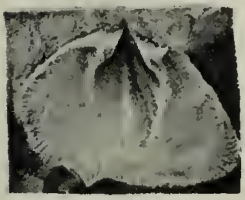
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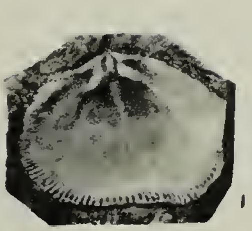
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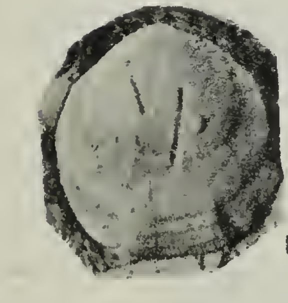
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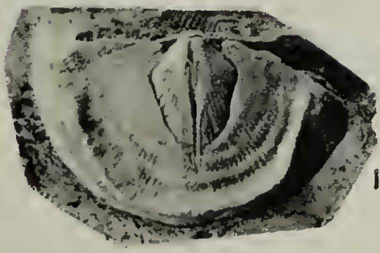
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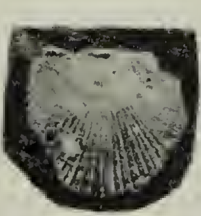
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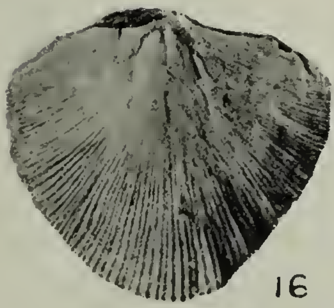
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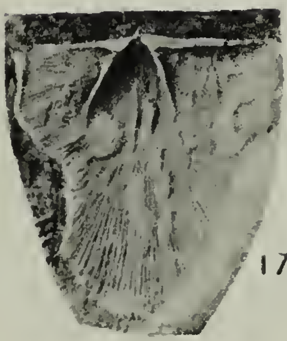
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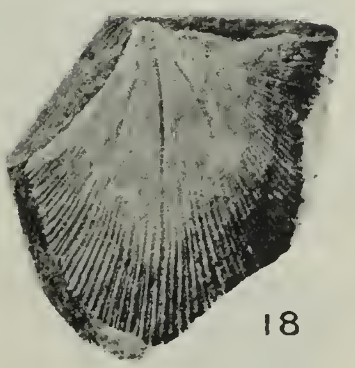
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Plate V

Camarotoechia bimesiornata n. sp. (Page 69.)

Figure 1. Side view. Vict. Mem. Mus., Cat. No. 5426, holotype.
Figure 2. The same specimen. Dorsal view.
Figure 3. The same specimen. Ventral view.
Figure 4. Dorsal valve. Vict. Mem. Mus., Cat. No. 5428, paratype.
Figure 5. Mould of interior of ventral valve. Vict. Mem. Mus., Cat. No. 5427, paratype—for enlarged drawing of cast, *See* Pl. XXX, fig. 9.

Camarotoechia nucula var. *planorugosa* n. var. (Page 69.)

Figure 6. Side view. Peabody Mus., Yale Univ., Cat. No. 429, holotype.
Figure 7. The same specimen. Dorsal view.
Figure 8. The same specimen. Ventral view.

Camarotoechia nucula mut. *moydartensis* n. mut. (Page 70.)

Figure 9. Side view. Vict. Mem. Mus., Cat. No. 5429, holotype.
Figure 10. The same specimen. Dorsal view.
Figure 11. The same specimen. Ventral view.

Camarotoechia llandoveriana var. *rossonia* n. var. (Page 70.)

Figure 12. Side view. Vict. Mem. Mus., Cat. No. 5430, holotype.
Figure 13. The same specimen. Dorsal view.
Figure 14. Ventral view. Peabody Mus., Yale Univ., Cat. No. 430, paratype.

Camarotoechia glomerosa n. sp. (Page 71.)

Figure 15. View from above. Vict. Mem. Mus., Cat. No. 5433, holotype.
Figure 16. The same specimen. Dorsal view.
Figure 17. The same specimen. Side view.
Figure 18. The same specimen. Ventral view.
Figure 19. The same specimen. End view.

Camarotoechia marklandensis n. sp. (Page 71.)

Figure 20. Ventral view. Vict. Mem. Mus., Cat. No. 5432, paratype.
Figure 21. The same. Dorsal valve. Peabody Mus., Yale Univ., Cat. No. 431, holotype.
Figure 22. The same specimen. Side view.

Camarotoechia squamifera n. sp. (Page 71.)

Figure 23. End view. Peabody Mus., Yale Univ., Cat. No. 432, holotype.
Figure 24. The same specimen. Side view.
Figure 25. The same specimen. Ventral view.
Figure 26. The same specimen. Dorsal view.
Figure 27. The same specimen. View from above.

Brachyprion gilpini (Dawson). (Page 61.)

Figure 28. Exterior ventral valve. Vict. Mem. Mus., Cat. No. 5421, plesiotype.
Figure 29. Interior ventral valve. Vict. Mem. Mus., Cat. No. 5420a, plesioplastotype.

Brachyprion (?) *honeymani* n. sp. (Page 62.)

Figure 30. Exterior ventral valve. Peabody Mus., Yale Univ., Cat. No. 433, holotype.

Amphistrophia arisaigensis n. sp. (Page 63.)

Figure 31. Exterior dorsal valve, Vict. Mem. Mus., Cat. No. 5422, holotype.

Schuchertella pecten (Linnaeus). (Page 63.)

Figure 32. Vict. Mem. Mus., Cat. No. 5423, plesiotype.

Chonetes tenuistriatus Hall. (Page 64.)

Figure 33. Ventral valve. Peabody Mus., Yale Univ., Cat. No. 434, plesiotype.
Figure 34. The same specimen X 2.

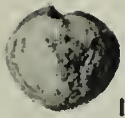
Chonetes novascoticus Hall. (Page 65.)

Figure 35. Ventral valve. Peabody Mus., Yale Univ., Cat. No. 435, plesiotype.
Figure 36. Ventral valve. Vict. Mem. Mus., Cat. No. 5424, plesiotype.

Chonetes novascoticus mut. *crassistriatus* n. mut. (Page 66.)

Figure 37. Ventral valve. Vict. Mem. Mus., Cat. No. 5425, holotype.

Plate No. V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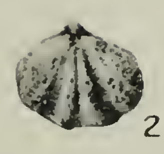
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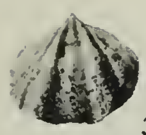
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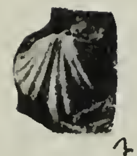
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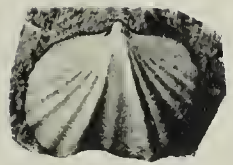
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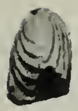
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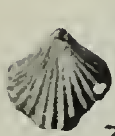
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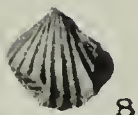
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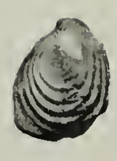
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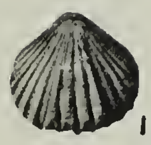
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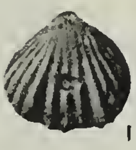
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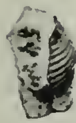
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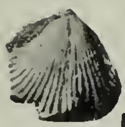
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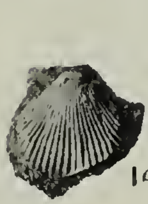
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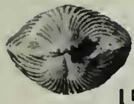
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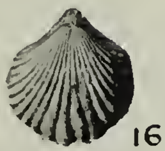
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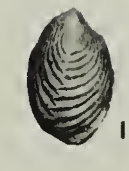
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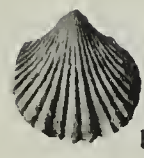
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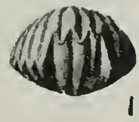
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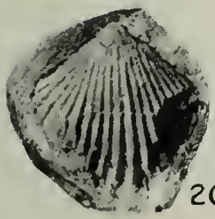
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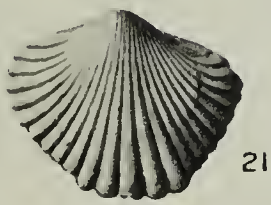
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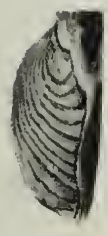
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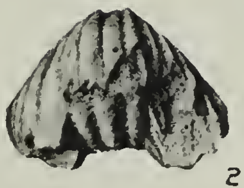
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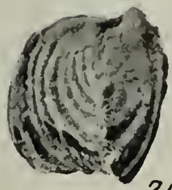
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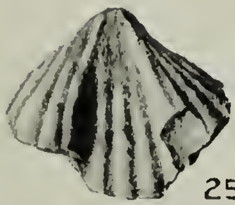
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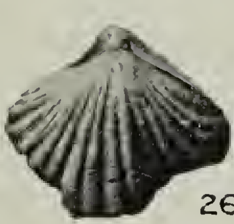
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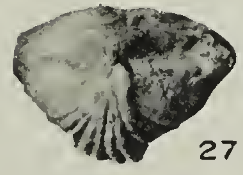
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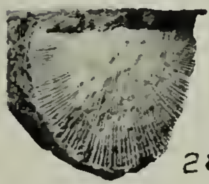
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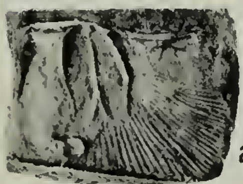
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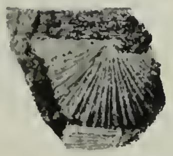
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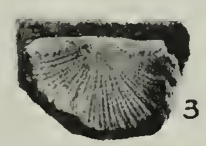
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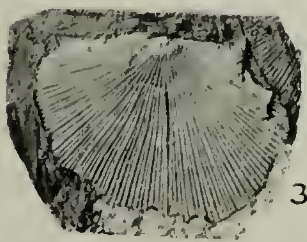
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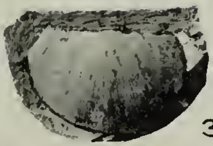
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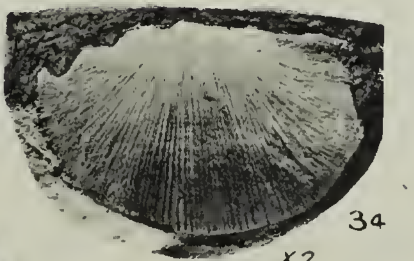
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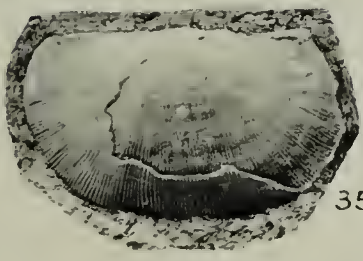
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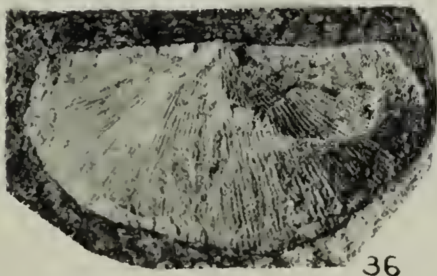
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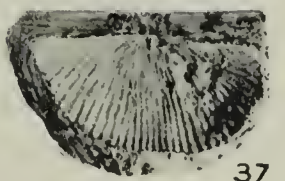
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PLATE VI

Chonetes novascoticus Hall. (Page 65.)

FIGURE 1. Slab with. Peabody Mus., Yale Univ., Cat. No. 436, plesiotype.

Plate No. VI

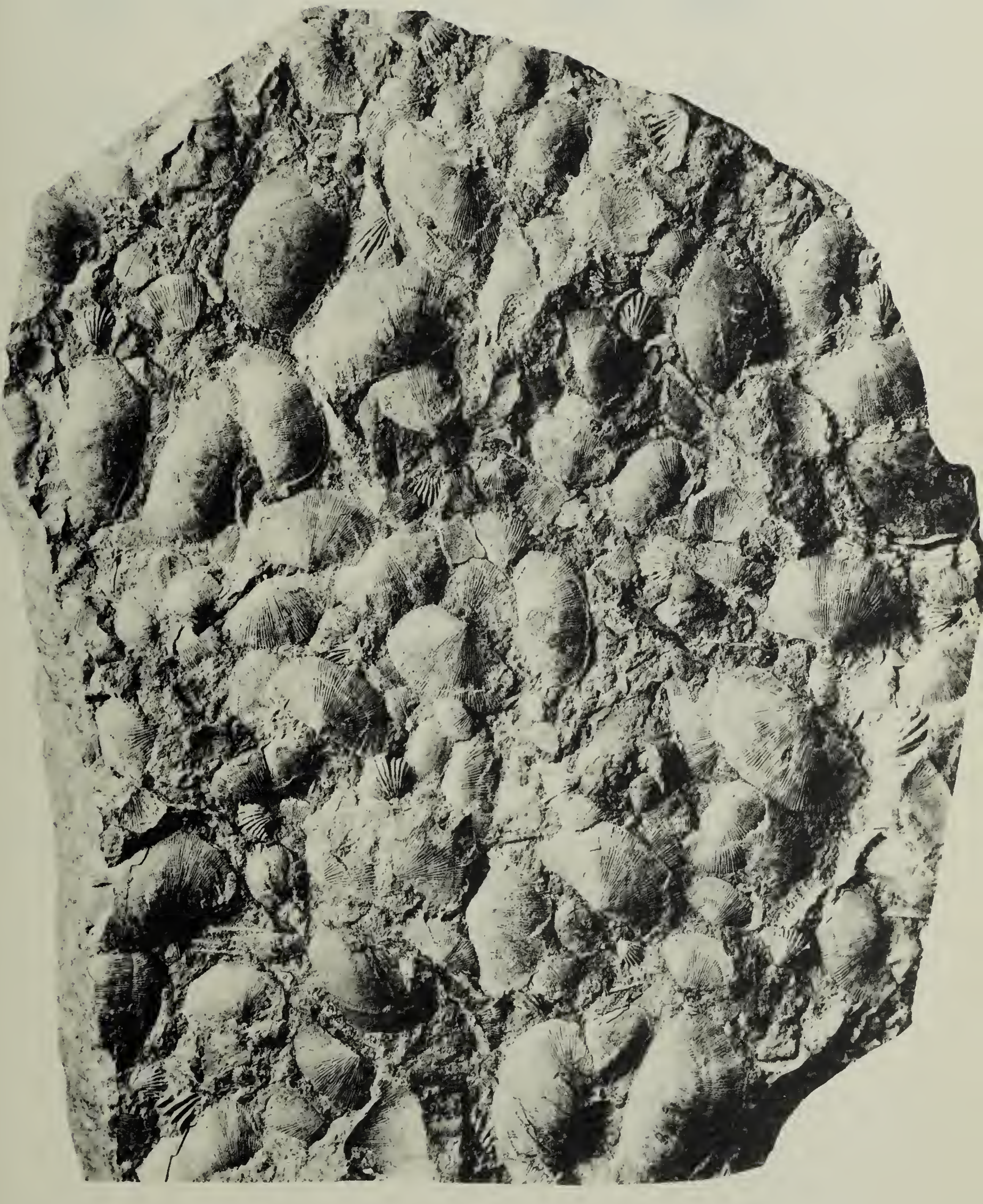


PLATE VII

Pectorhyncha antiqua n. sp. (Page 72.)

FIGURE 1. Dorsal view. Peabody Mus., Yale Univ., Cat. No. 437, holotype.
FIGURE 2. The same specimen. Ventral view.
FIGURE 3. The same specimen. End view.
FIGURE 4. The same specimen. Side view.
FIGURE 5. The same specimen. View from above.
FIGURE 6. Interior dorsal valve. Peabody Mus., Yale Univ., Cat. No. 437a, paraplastotype. For enlargement *See* Pl. XXIX, fig. 5.
FIGURE 7. Dorsal view. Peabody Mus., Yale Univ., Cat. No. 437b, paratype.
FIGURE 8. The same specimen. Ventral view.
FIGURE 9. The same specimen. End view.
FIGURE 10. The same specimen. Side view.
FIGURE 11. The same specimen. View from above.
FIGURE 12. Interior ventral valve. Peabody Mus., Yale Univ., Cat. No. 437c, paraplastotype. For enlargement *See* Pl. XXIX, fig. 1.

Pectorhyncha obtusiplicata (Hall). (Page 73.)

FIGURE 13. Interior ventral valve. Note tooth cemented to wall. Peabody Mus., Yale Univ., Cat. No. 438, plesioplastotype. For enlargement *See* Pl. XXIX, fig. 3.
FIGURE 14. Interior dorsal valve. Peabody Mus., Yale Univ., Cat. No. 438a, plesioplastotype.
FIGURE 15. Interior dorsal valve. Peabody Mus., Yale Univ., Cat. No. 438b, plesioplastotype. For enlarged drawings *See* Pl. XXX, figs. 5, 8.

Eatonioides westoni n. sp. (Page 74.)

FIGURE 16. Interior ventral valve. Peabody Mus., Yale Univ., Cat. No. 439, holoplastotype. For drawing *See* Pl. XXX, fig. 7.
FIGURE 17. The same specimen. Interior of dorsal valve. For drawing *See* Pl. XXX, fig. 4.

Pectorhyncha obtusiplicata (Hall). (Page 73.)

FIGURE 18. Dorsal view. Peabody Mus., Yale Univ., Cat. No. 438c, plesiotype.
FIGURE 19. The same specimen. Ventral view.
FIGURE 20. Dorsal view. Peabody Mus., Yale Univ., Cat. No. 438d, plesiotype.

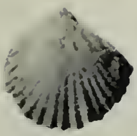
Eatonioides westoni n. sp. (Page 74.)

FIGURE 21. Exterior dorsal valve. Peabody Mus., Cat. No. 439a, paratype.

Eatonioides lamellornatus McLearn. (Page 75.)

FIGURE 22. Ventral view. Vict. Mem. Mus., Cat. No. 5435, holotype. For enlargement of surface *See* Pl. XXX, fig. 1.
FIGURE 23. The same specimen. Dorsal view.
FIGURE 24. The same specimen. Side view.
FIGURE 25. The same specimen. End view.
FIGURE 26. The same specimen. View from above.
FIGURE 27. View from above. Peabody Mus., Yale Univ., Cat. No. 440, paratype.
FIGURE 28. The same specimen. End view.
FIGURE 29. The same specimen. Side view.
FIGURE 30. The same specimen. Dorsal view.
FIGURE 31. The same specimen. Ventral view.

Plate No. VII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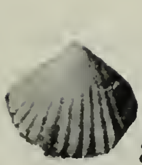
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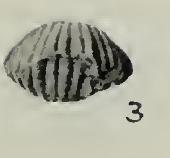
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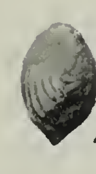
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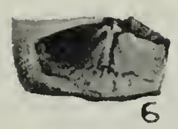
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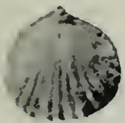
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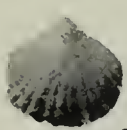
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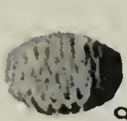
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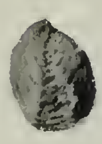
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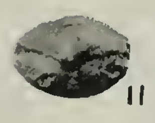
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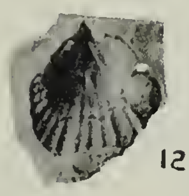
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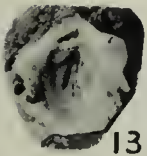
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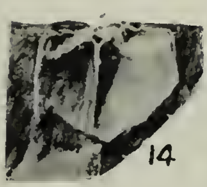
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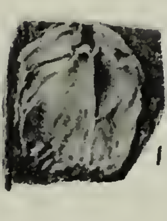
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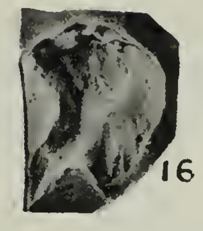
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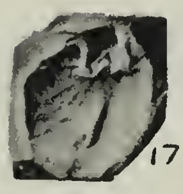
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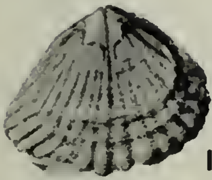
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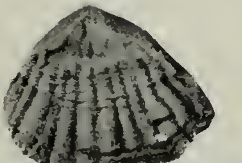
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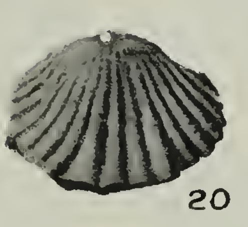
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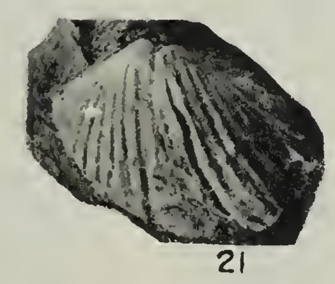
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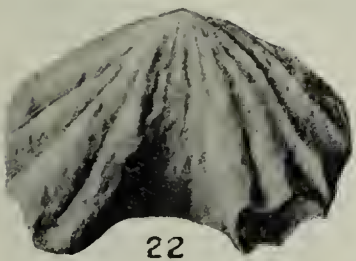
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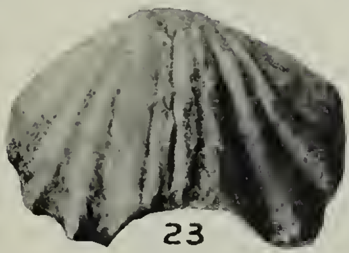
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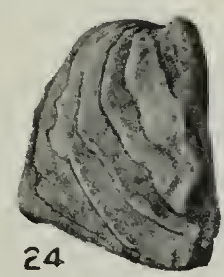
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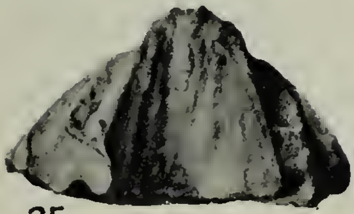
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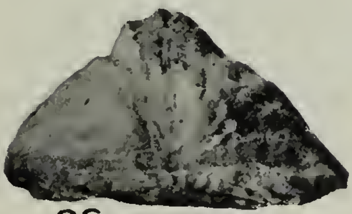
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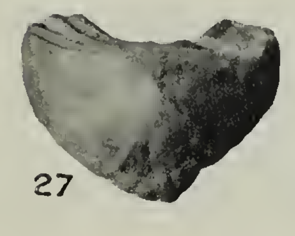
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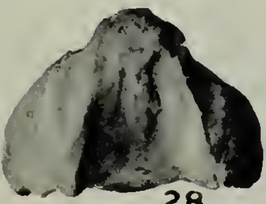
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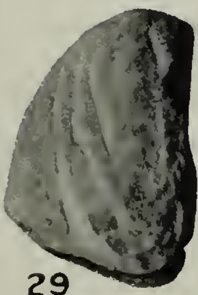
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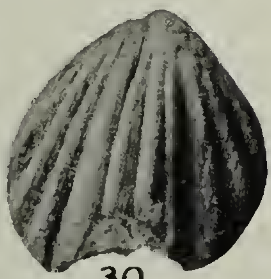
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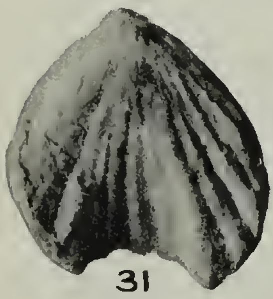
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PLATE VIII

Plagiorhyncha decemplicata (Sowerby). (Page 77.)

FIGURE 1. Ventral valve. Vict. Mem. Mus., Cat. No. 5438, plesiotype.
FIGURE 2. Dorsal valve. Vict. Mem. Mus., Cat. No. 5437, plesiotype.
FIGURE 3. Dorsal valve. Vict. Mem. Mus., Cat. No. 5439, plesiotype.
FIGURE 4. Ventral valve. Vict. Mem. Mus., Cat. No. 5440, plesiotype.

Plagiorhyncha plastica n. sp. (Page 78.)

FIGURE 5. Dorsal valve. Striate form. *See also* fig. 33. Peabody Mus., Yale Univ., Cat. No. 441, paratype.
FIGURE 6. Dorsal valve. Costæ breaking down into striæ. Peabody Mus., Yale Univ., Cat. No. 441a, holotype.
FIGURE 7. Ventral valve. Costæ breaking down into striæ. Peabody Mus., Cat. No. 441b, paratype. For enlargement *See* Pl. XXVIII, fig. 11.

Plagiorhyncha plastica var. *media* n. var. (Page 78.)

FIGURE 8. Dorsal valve. Peabody Mus., Cat. No. 441c, holotype.
FIGURE 9. Dorsal valve. Peabody Mus., Yale Univ., Cat. No. 441d, paratype.

Plagiorhyncha glassi (Davidson). (Page 79.)

FIGURE 10. Dorsal view. Peabody Mus., Cat. No. 441e, plesiotype.
FIGURE 11. The same specimen. Side view.
FIGURE 12. The same specimen. End view.
FIGURE 13. The same. Dorsal view. Peabody Mus., Yale Univ., Cat. No. 441f, plesiotype.
FIGURE 14. The same specimen. Ventral view.
FIGURE 15. The same specimen. Side view.
FIGURE 16. Ventral valve. Vict. Mem. Mus., Cat. No. 5441a, plesioplastotype.
FIGURE 17. Interior dorsal valve. *See also* fig. 36. Vict. Mem. Mus., Cat. No. 5442, plesioplastotype.

Delthyris crispa (Hisinger). (Page 81.)

FIGURE 18. Dorsal valve. Peabody Mus., Yale Univ., Cat. No. 442, plesiotype.

Delthyris crispa mut. *moydartensis* n. mut. (Page 82.)

FIGURE 19. Dorsal view. Peabody Mus., Yale Univ., Cat. No. 442a, holotype.
FIGURE 20. The same specimen. Ventral view.
FIGURE 21. The same specimen. Side view.
FIGURE 22. Ventral view. Peabody Mus., Yale Univ., Cat. No. 442b, paratype X 2.
FIGURE 23. The same specimen. Dorsal view X 2.
FIGURE 24. The same specimen. Side view X 2.

Wilsonia wilsoni var. *saffordi* (Hall). (Page 75.)

FIGURE 25. Dorsal view. Peabody Mus., Yale Univ., Cat. No. 443, plesiotype.
FIGURE 26. The same specimen. Ventral view.
FIGURE 27. The same specimen. Side view.
FIGURE 28. The same specimen. View from above.
FIGURE 29. The same specimen. End view.

Delthyris rugaecosta mut. *prima* n. mut. (Page 83.)

FIGURE 30. Dorsal valve. Peabody Mus., Yale Univ., Cat. No. 442c, holotype.

Delthyris rugaecosta (Hall). (Page 82.)

FIGURE 31. Cardinal area. Vict. Mem. Mus., Cat. No. 3095a, plesiotype.

Wilsonia wilsoni mut. *stonehousensis* n. mut. (Page 76.)

FIGURE 32. Ventral valve. Vict. Mem. Mus., Cat. No. 5436, holotype.

Plagiorhyncha plastica n. sp. (Page 78.)

FIGURE 33. Figure 5 X 2. Striate specimen. Peabody Mus., Yale Univ., Cat. No. 441, paratype.

Eatonioides lamellornatus McLearn. (Page 75.)

FIGURE 34. Interior ventral valve. Vict. Mem. Mus., Cat. No. 5434a, paraplastotype.
FIGURE 35. Interior dorsal valve. Cat. No. 5434b, paraplastotype.

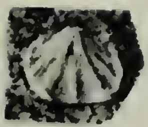
Plagiorhyncha glassi (Davidson). (Page 79.)

FIGURE 36. Figure 17 X 5. Interior dorsal valve. Vict. Mem. Mus., Cat. No. 5442, plesioplastotype.

Atrypa reticularis (Linnaeus). (Page 80.)

FIGURE 37. High form. Dorsal valve. Vict. Mem. Mus., Cat. No. 5443, plesiotype.
FIGURE 38. High form. Ventral valve. Peabody Mus., Yale Univ., Cat. No. 444, plesiotype.

Plate No. VIII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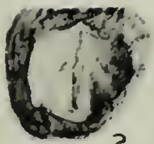
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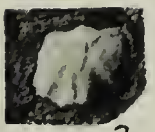
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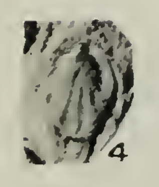
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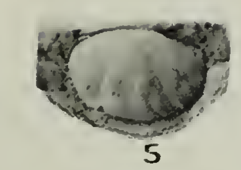
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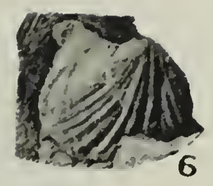
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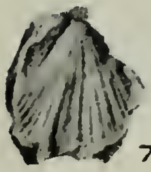
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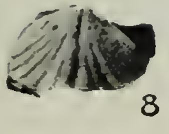
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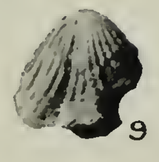
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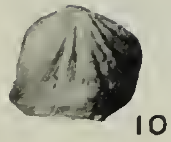
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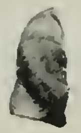
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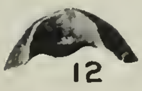
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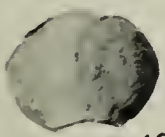
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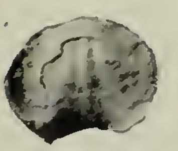
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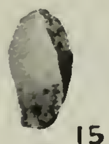
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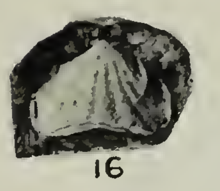
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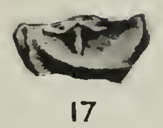
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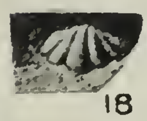
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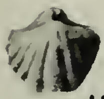
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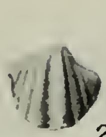
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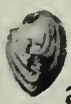
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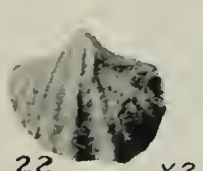
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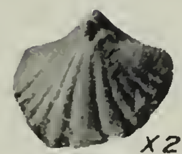
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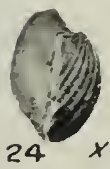
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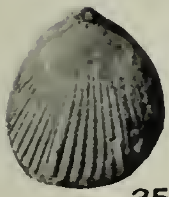
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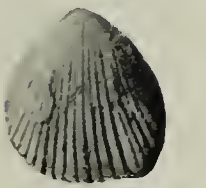
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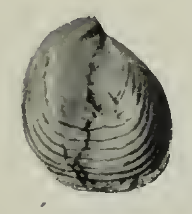
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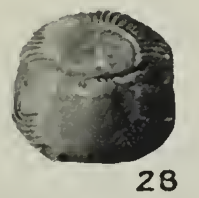
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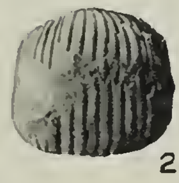
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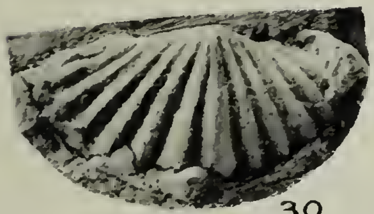
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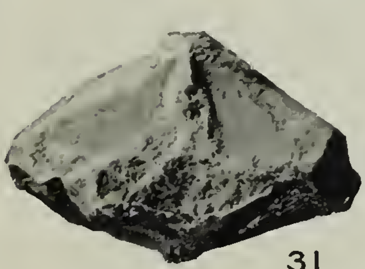
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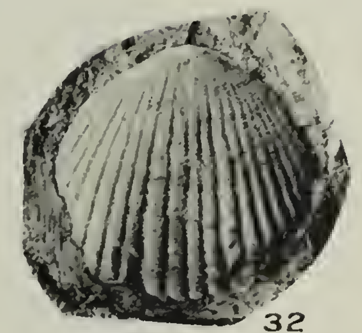
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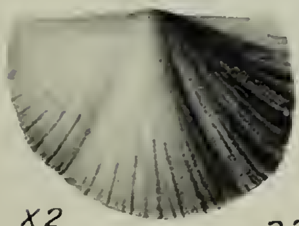
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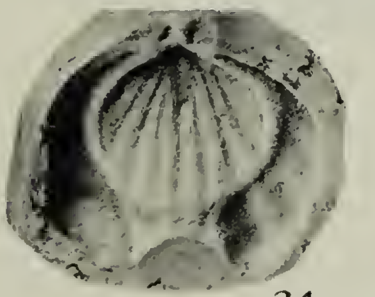
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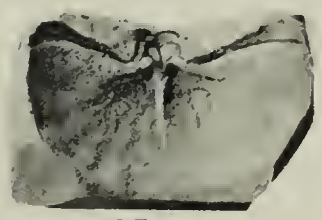
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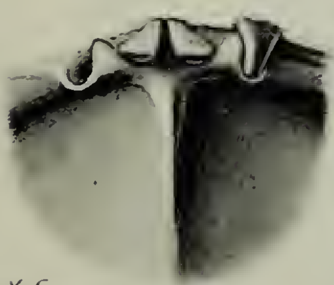
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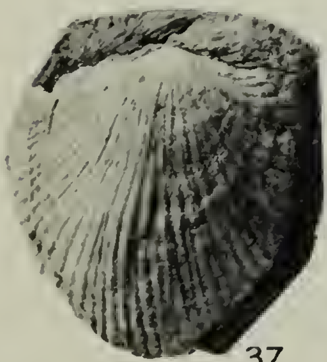
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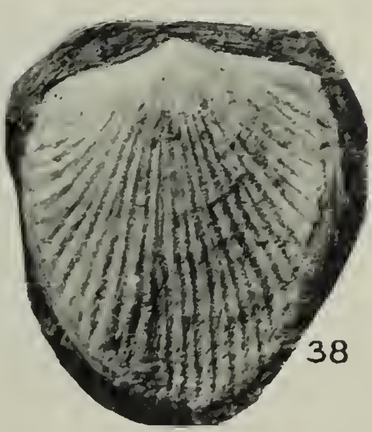
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Plate IX

Delthyris rugaecosta Hall. (Page 82.)

Figure 1. Distorted comparatively narrow specimen. Dorsal view. Vict. Mem. Mus., Cat. No. 3095, plesiotype.
Figure 2. The same specimen. Ventral view. Note mould of median septum.
Figure 3. Dorsal valve. Vict. Mem. Mus., Cat. No. 3095c, plesiotype.

Meristina billingsi (Dawson). (Page 89.)

Figure 4. Dorsal valve. Vict. Mem. Mus., Cat. No. 5451, plesiotype.
Figure 5. Mould interior ventral valve. Vict. Mem. Mus., Cat. No. 5450, plesiotype.

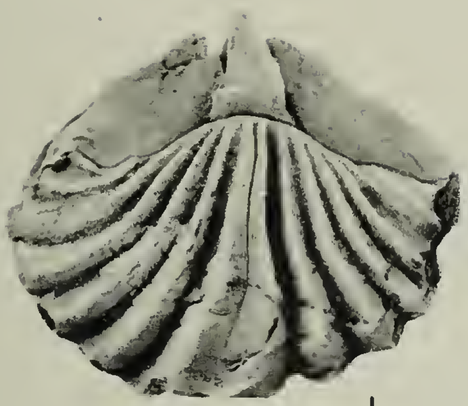
Meristina tumida (Dalman)? (Page 89.)

Figure 6. Vict. Mem. Mus., Cat. No. 5448, plesiotype.
Figure 7. Vict. Mem. Mus., Cat. No. 5449, plesiotype.

Eospirifer stonehousensis n. sp. (Page 84.)

Figure 8. Ventral valve. Peabody Mus., Yale Univ., Cat. No. 442d, holotype.

Plate No. IX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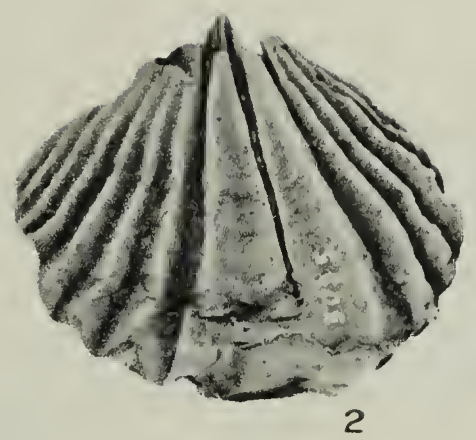
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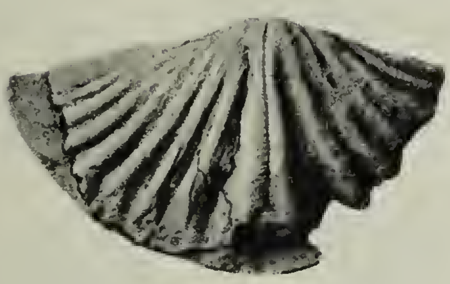
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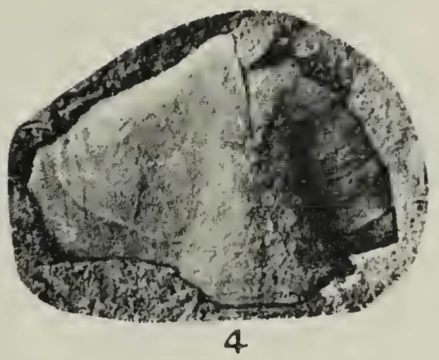
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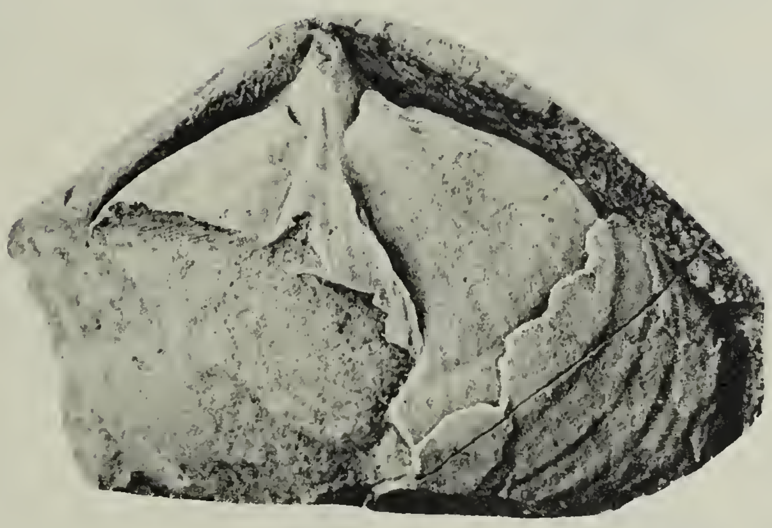
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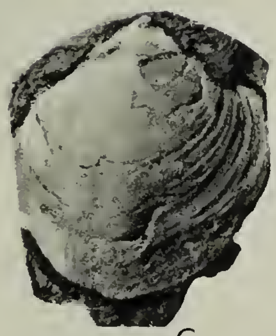
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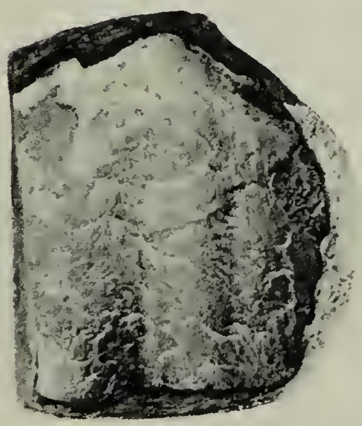
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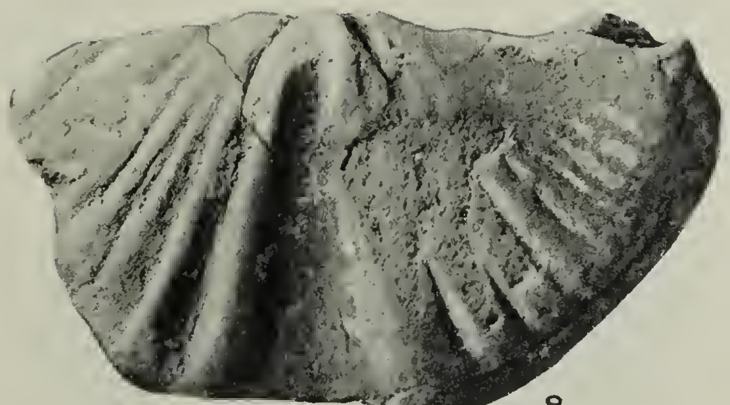
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Plate X

Rhynchospira salteri, var. *acadiae* (Hall). (Page 85.)

Figure 1. Dorsal view. Peabody Mus., Yale Univ., Cat. No. 445, plesiotype.
Figure 2. Side view. Peabody Mus., Yale Univ., Cat. No. 445a, plesiotype.
Figure 3. The same specimen. Ventral view.
Figure 4. The same specimen. Dorsal view.
Figure 5. Side view. Peabody Mus., Yale Univ., Cat. No. 445b, plesiotype.
Figure 6. The same specimen. Ventral view.
Figure 7. The same specimen. Dorsal view.

Whitfieldella (?) *northumberlandensis* n. sp. (Page 87.)

Figure 8. Ventral valve. Peabody Mus., Yale Univ., Cat. No. 445c, holotype.

Camarotoechia llandoveriana var. *rossonia* n. var. (Page 70.)

Figure 9. Dorsal valve. Vict. Mem. Mus., Cat. No. 5431, paratype.

Pholidops acadiensis (Hall). (Page 50.)

Figure 10. Interior view. Peabody Mus., Yale Univ., Cat. No. 445d, plesiotype. *See* Pl. II, fig. 23.

Cuneamya marklandensis n. sp. (Page 97.)

Figure 11. Right valve. Peabody Mus., Yale Univ., Cat. No. 446, holotype.
Figure 12. The same specimen. View from above.

Cuneamya arata (Hall). (Page 97.)

Figure 13. Left valve. Vict. Mem. Mus., Cat. No. 5453, plesiotype.

Whitfieldella (?) *crassa* var. *beechhillensis* n. var. (Page 87.)

Figure 14. Exterior ventral valve. Vict. Mem. Mus., Cat. No. 5444a, holoplastotype.
Figure 15. Interior ventral valve. Vict. Mem. Mus., Cat. No. 5445a, paraplastotype.
Figure 16. Interior ventral valve. Vict. Mem. Mus., Cat. No. 5446a, paraplastotype.

Grammysia mcadamensis n. sp. (Page 95.)

Figure 17. Right valve. Peabody Mus., Yale Univ., Cat. No. 446a, holotype.

Rhynchospira sinuata Hall. (Page 86.)

Figure 18. Ventral valve. Peabody Mus., Yale Univ., Cat. No. 445e, plesiotype.
Figure 19. Dorsal valve. Peabody Mus., Yale Univ., Cat. No. 445f, plesiotype.

Coelospira hemispherica (Sowerby). (Page 90.)

Figure 20. Ventral valve. Peabody Mus., Yale Univ., Cat. No. 447, plesioplastotype.
Figure 21. Dorsal valve. Peabody Mus., Yale Univ., Cat. No. 447a, plesioplastotype.

Whitfieldella? cf. *angustifrons* (McCoy). (Page 88.)

Figure 22. Mould of interior. Side view. Vict. Mem. Mus., Cat. No. 5447, plesiotype.
Figure 23. The same specimen. Ventral view.
Figure 24. The same specimen. Dorsal view.

Grammysia unilira n. sp. (Page 92.)

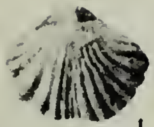
Figure 25. Vict. Mem. Mus., Cat. No. 5454, holotype.

Cuneamya crassiornata n. sp. (Page 96.)

Figure 26. Peabody Mus., Yale Univ., Cat. No. 446b, holotype.

Cuneamya arata (Hall). (Page 97.)

Figure 27. Right valve. Vict. Mem. Mus., Cat. No. 5452, plesiotype.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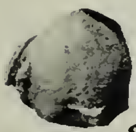
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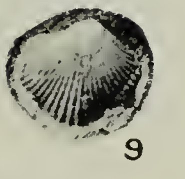
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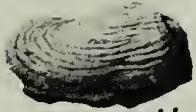
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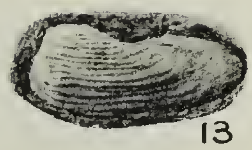
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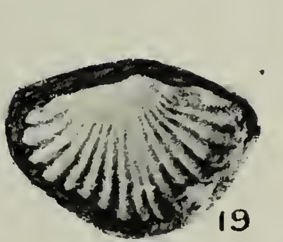
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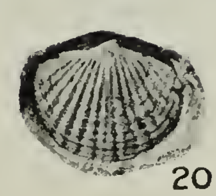
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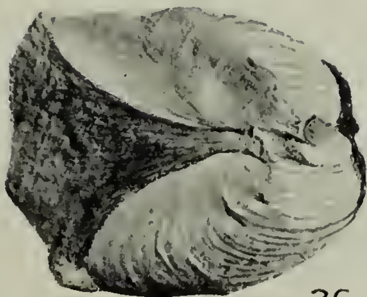
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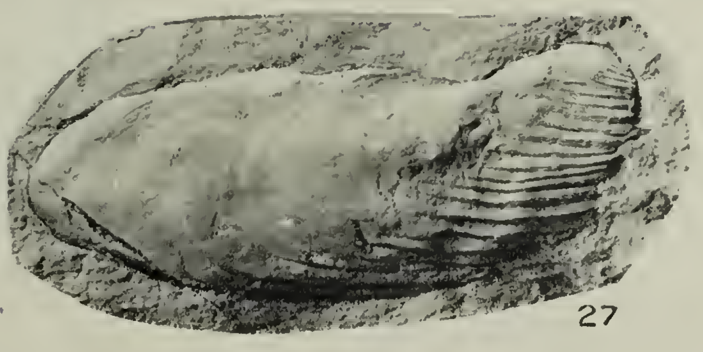
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PLATE XI

Grammysia remota Billings. (Page 94.)

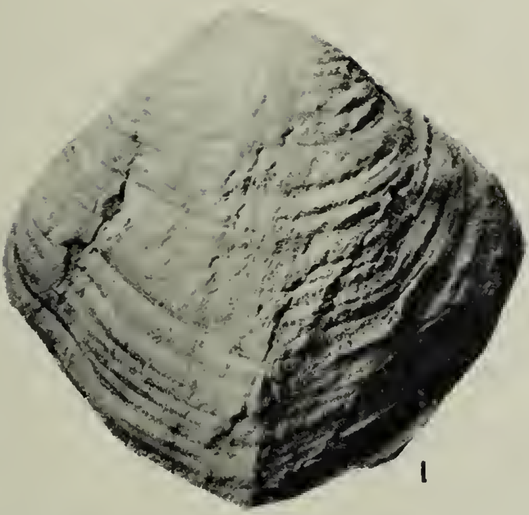
FIGURE 1. Vict. Mem. Mus., Cat. No. 5456, plesiotype.
FIGURE 2. Same specimen.
FIGURE 3. Same specimen. View from above.
FIGURE 4. Vict. Mem. Mus., Cat. No. 3129, holotype.

Grammysia triangulata (Salter). (Page 93.)

FIGURE 5. Right valve. Vict. Mem. Mus., Cat. No. 5455, plesiotype.

Grammysia cingulata mut. *intermedia* n. mut. (Page 92.)

FIGURE 6. Right valve. Peabody Mus., Yale Univ., Cat. No. 448, holotype.
FIGURE 7. Right valve. Peabody Mus., Yale Univ., Cat. No. 448a, paratype.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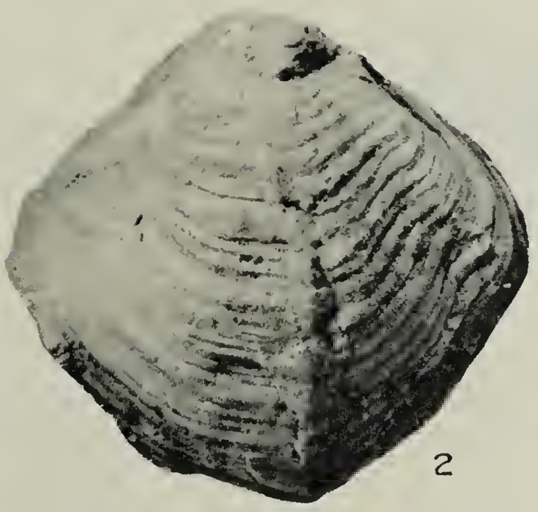
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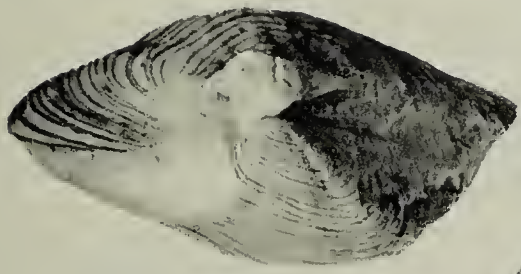
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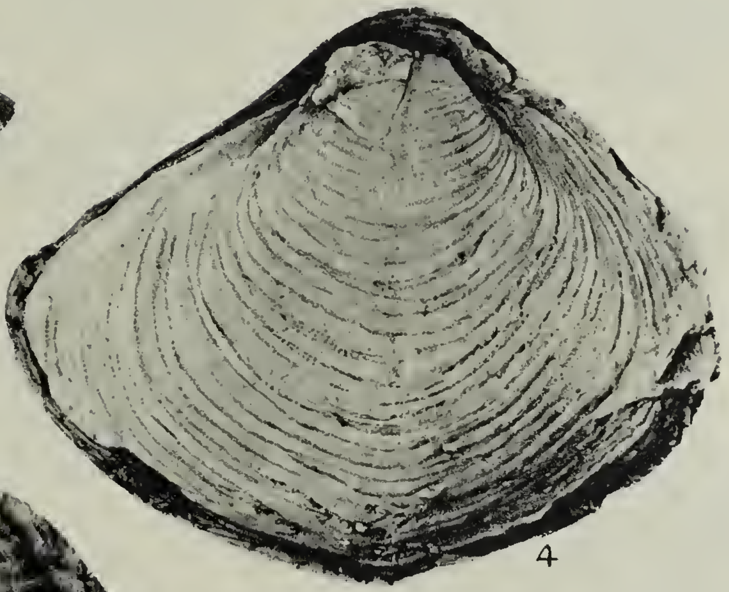
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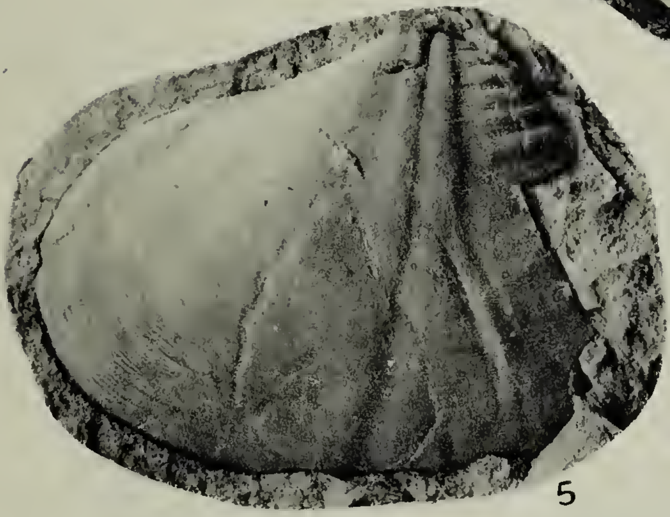
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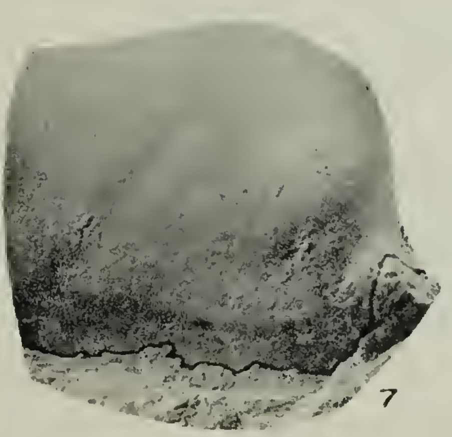
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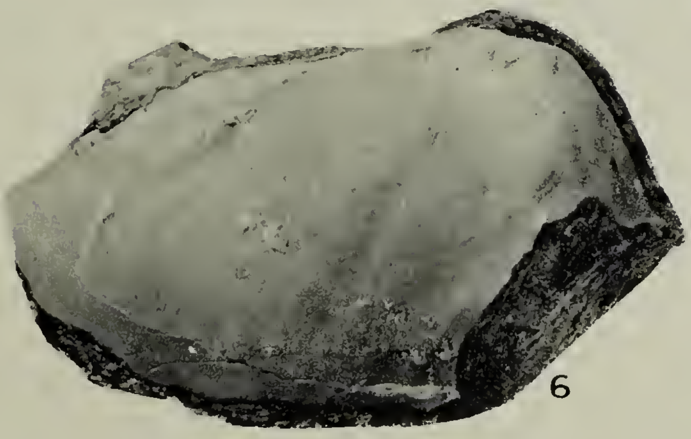
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Plate XII

Nucula arisaigensis n. sp. (Page 98.)

Figure 1. Mould of interior. Vict. Mem. Mus., Cat. No. 5458, holotype.
Figure 2. Same specimen from above.
Figure 3. Same specimen. Mould of interior.

Tancrediopsis altistriata n. sp. (Page 100.)

Figure 4. Left valve. Peabody Mus., Yale Univ., Cat. No. 449, holotype.
Figure 5. Right valve. Peabody Mus., Yale Univ., Cat. No. 449a, paratype.

Palaeoneilo antigonishensis n. sp. (Page 99.)

Figure 6. Left valve. Peabody Mus., Yale Univ., Cat. 449b, holotype.

Nucula arisaigensis n. sp. (Page 98.)

Figure 7. Mould of interior. Vict. Mem. Mus., Cat. No. 5459, paratype.

Palaeoneilo attenuata (Hall). (Page 98.)

Figure 8. Right valve. Vict. Mem. Mus., Cat. No. 5462, plesiotype.
Figure 9. Left valve. Vict. Mem. Mus., Cat. No. 5461, plesiotype.
Figure 10. Right valve. Vict. Mem. Mus., Cat. No. 5460, plesiotype.

Tancrediopsis lauta n. sp. (Page 101.)

Figure 11. Left valve X 4, Peabody Mus., Yale Univ., Cat. No. 449c, holotype.

Tancrediopsis mundiornata n. sp. (Page 100.)

Figure 12. Right valve. Peabody Mus., Yale Univ., Cat. No. 449d, holotype.

Nuculites concentricus var. *subovatus* (Hall). (Page 102.)

Figure 13. Left valve. Vict. Mem. Mus., Cat. No. 5468, plesiotype.

Palaeoneilo twenhofeli n. sp. (Page 99.)

Figure 14. X 3. Peabody Mus., Yale Univ., Cat. No. 449e, holotype.

Nuculites concentricus (Hall). (Page 101.)

Figure 15. Left valve. Peabody Mus., Yale Univ., Cat. No. 450, plesiotype.

Nuculites concentricus var. *subovatus* (Hall). (Page 102.)

Figure 16. Right valve. Vict. Mem. Mus., Cat. No. 5469, plesiotype. For drawing *See* Pl. XXX, figs. 2, 3.
Figure 17. The same specimen from above.

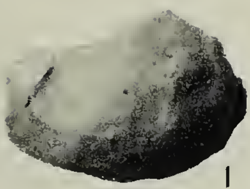
Nuculites concentricus (Hall). (Page 101.)

Figure 18. Left valve. Vict. Mem. Mus., Cat. No. 5463, plesiotype. For drawing *See* Pl. XXIX, fig. 11.

Grammysia obliqua (McCoy). (Page 94.)

Figure 19. Right side. Peabody Mus., Yale Univ., Cat. No. 485, plesiotype.
Figure 20. The same specimen. Left side.

Plate No. XII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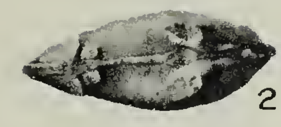
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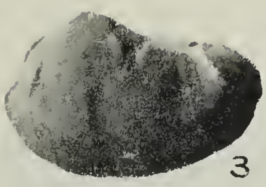
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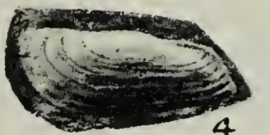
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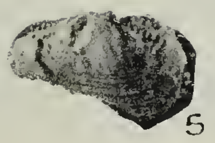
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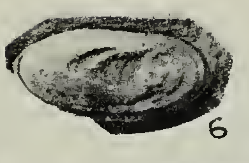
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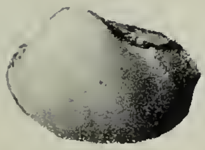
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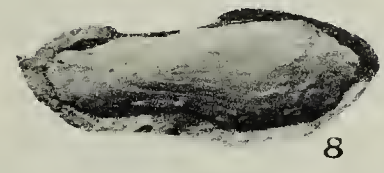
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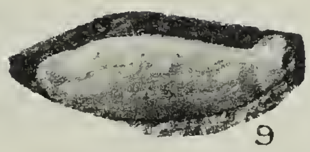
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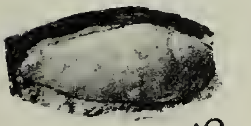
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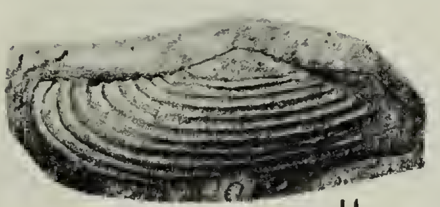
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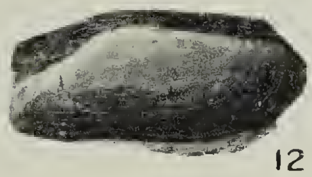
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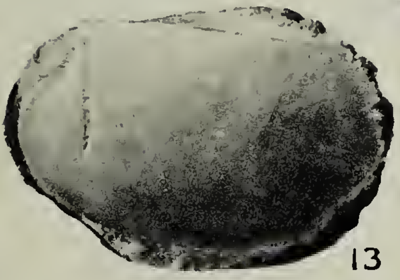
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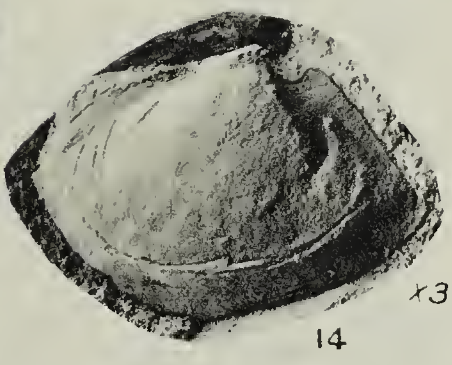
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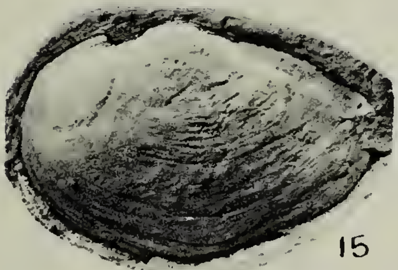
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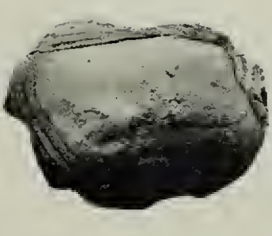
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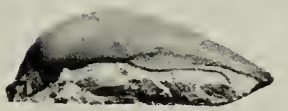
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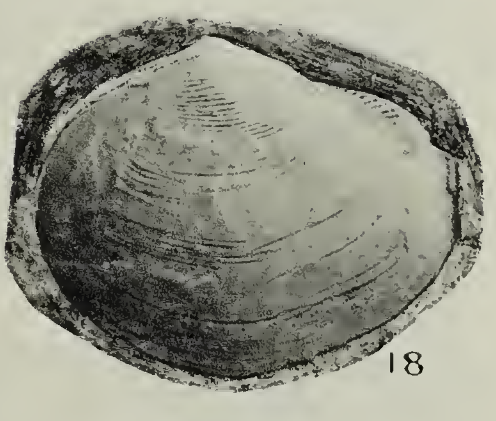
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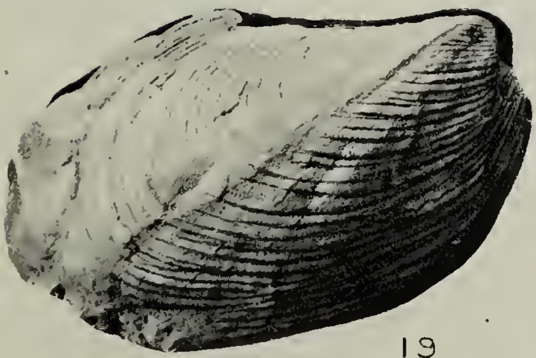
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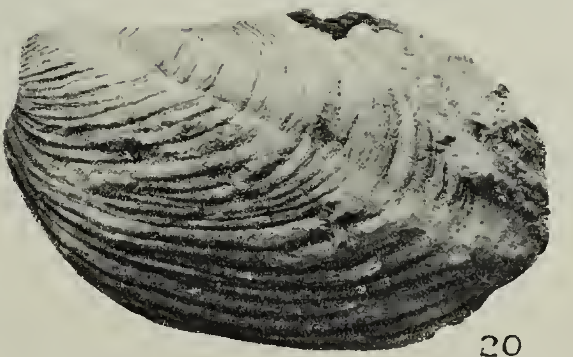
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PLATE XIII

Nuculites cawdori (Sowerby). (Page 103.)

FIGURE 1. High form with central beak. Vict. Mem. Mus., Cat. No. 5472, plesiotype.
FIGURE 2. Beak a little anterior to the middle. Vict. Mem. Mus., Cat. No. 5474, plesiotype.
FIGURE 3. Long form with central beak. Peabody Mus., Yale Univ., Cat. No. 484, plesiotype.

Nuculites cawdori mut. *rossonia* n. mut. (Page 104.)

FIGURE 4. Peabody Mus., Yale Univ., Cat. No. 451, paratype.
FIGURE 5. Peabody Mus., Yale Univ., Cat. No. 451a, holotype. For enlarged drawing *See* Pl. XXX, fig. 6.

Nuculites cawdori var. *elongatus* (Hall). (Page 104.)

FIGURE 6. Form of variety nearest to *N. cawdori*, Vict. Mem. Mus., Cat. No. 5475, plesiotype.
FIGURE 7. Beak more anterior; a robust form. Vict. Mem. Mus., Cat. No. 5476, plesiotype.
FIGURE 8. Beak more advanced. Vict. Mem. Mus., Cat. No. 5478, plesiotype.
FIGURE 9. Beak nearly terminal. Vict. Mem. Mus., Cat. No. 5477, plesiotype.
FIGURE 10. Short, narrow form with nearly terminal beaks. Vict. Mem. Mus., Cat. No. 5479, plesiotype.
FIGURE 11. Short, high form. Vict. Mem. Mus., Cat. No. 5480, plesiotype.

Nuculites cawdori var. *erectus* (Hall). (Page 106.)

FIGURE 12. Right valve. Vict. Mem. Mus., Cat. No. 5592, plesiotype. For enlargement *See* Pl. XXVIII, fig. 13.
FIGURE 13. Vict. Mem. Mus., Cat. No. 3104a, plesiotype.

Nuculites honeymani n. sp. (Page 106.)

FIGURE 14. Peabody Mus., Yale Univ., Cat. No. 451b, holotype.

Nuculites novascoticus n. sp. (Page 106.)

FIGURE 15. Vict. Mem. Mus., Cat. No. 6032, holotype.

Nuculites sp. (Page 107.)

FIGURE 16. Peabody Mus., Yale Univ., Cat. No. 451c.

Phthonia? semiradiata (Hall). (Page 91.)

FIGURE 17. Left valve. Vict. Mem. Mus., Cat. No. 5602, plesiotype.
FIGURE 18. Right valve. Vict. Mem. Mus., Cat. No. 5603, plesiotype.

Honeymania planimarginata McLearn. (Page 112.)

FIGURE 19. X 10 to show dentition. Vict. Mem. Mus., Cat. No. 5605, paratype.
FIGURE 20. The same specimen X 3.
FIGURE 21. Another specimen. Vict. Mem. Mus., Cat. No. 5604, holotype.

Honeymania elongata n. sp. (Page 112.)

FIGURE 22. Right valve. Vict. Mem. Mus., Cat. No. 5607, paratype.
FIGURE 23. Another specimen of right valve. Natural size. Vict. Mem. Mus., Cat. No. 5606, holotype.
FIGURE 24. The same specimen X 4. Drawing.

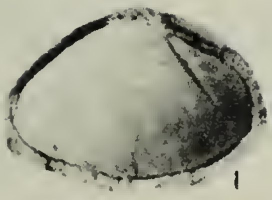
Nuculites concentricus var. *subequilatus* n. var. (Page 103.)

FIGURE 25. Left valve. Vict. Mem. Mus., Cat. No. 5465, paratype.
FIGURE 26. Vict. Mem. Mus., Cat. No. 5464, holotype.

Nuculites concentricus var. *subovatus* (Hall). (Page 102.)

FIGURE 27. Left valve. Vict. Mem. Mus., Cat. No. 5467, plesiotype.
FIGURE 28. Another specimen, with beaks advanced. Vict. Mem. Mus., Cat. No. 5466, plesiotype. For drawing *See* Pl. XXX, fig. 11.
FIGURE 29. Beaks not so anterior. Vict. Mem. Mus., Cat. No. 5471, plesiotype.
FIGURE 30. Left valve. Vict. Mem. Mus., Cat. No. 5470, plesiotype. For drawing *See* Pl. XXVIII, fig. 14.

Plate No. XIII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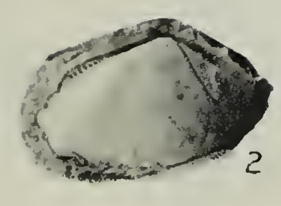
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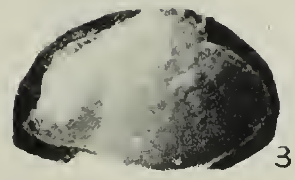
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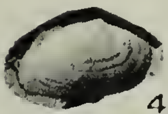
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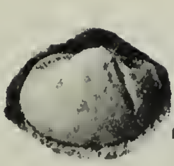
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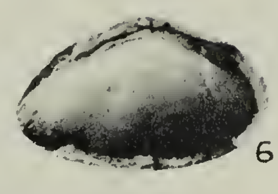
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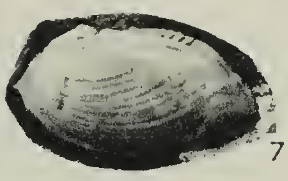
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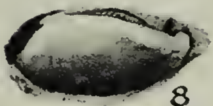
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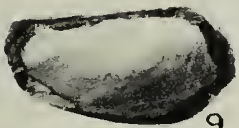
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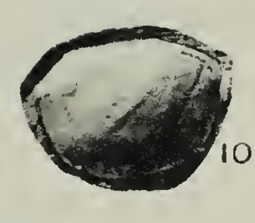
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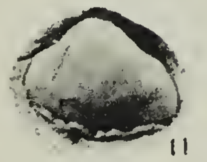
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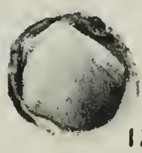
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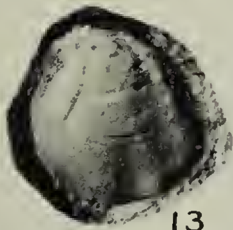
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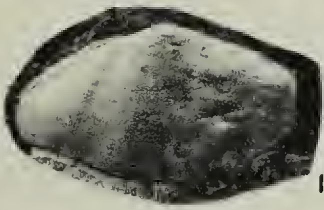
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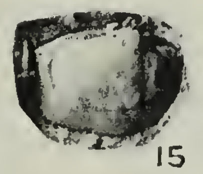
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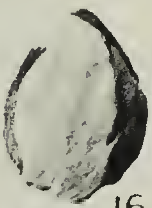
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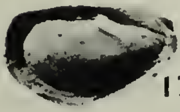
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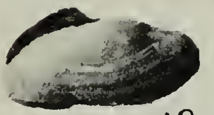
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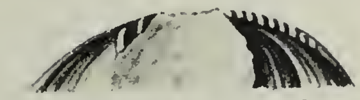

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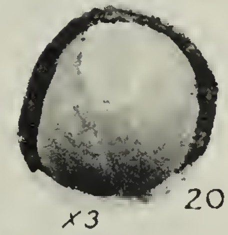

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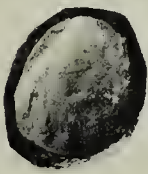
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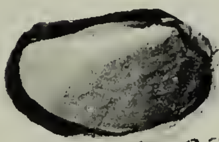
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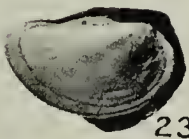
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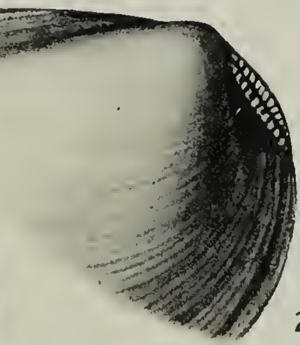

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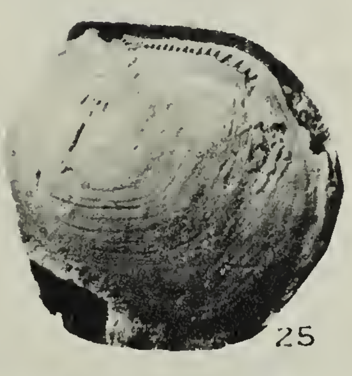
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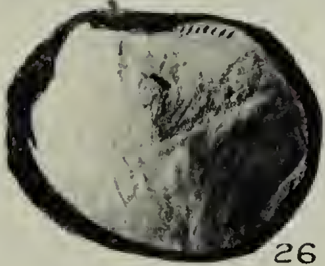
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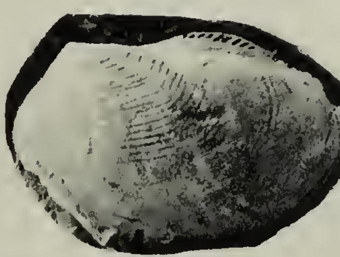
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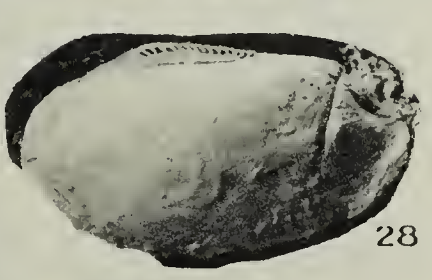
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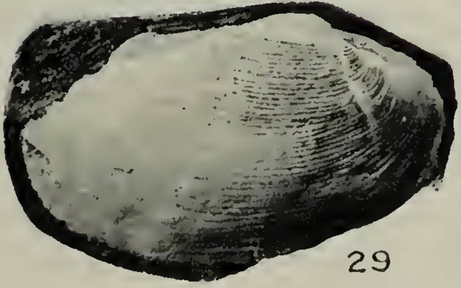
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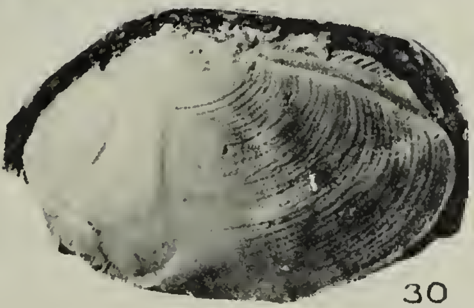
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PLATE XIV

Leptodesma subrhomboidea n. sp. (Page 118.)

FIGURE 1. Left valve. Vict. Mem. Mus., Cat. No. 5619, paratype.
FIGURE 2. Another specimen of left valve. Peabody Mus., Yale Univ., Cat. No. 452, holotype.

Pterinea emacerata var. *arisaigensis* n. var. (Page 113.)

FIGURE 3. Right valve. Peabody Mus., Yale Univ., Cat. No. 452a, paratype.
FIGURE 4. Left valve. Peabody Mus., Yale Univ., Cat. No. 452b, holotype.

Leptodesma acadiensis n. sp. (Page 118.)

FIGURE 5. Left valve. Peabody Mus., Yale Univ., Cat. No. 486, holotype.

Pterinea antigonishensis n. sp. (Page 114.)

FIGURE 6. Left valve. Peabody Mus., Yale Univ., Cat. No. 452c, holotype.

Pterinea prominiradiata n. sp. (Page 114.)

FIGURE 7. Left view. Peabody Mus., Yale Univ., Cat. No. 452d, paratype.
FIGURE 8. The same specimen. Right view.

Pterinea honeymani (Hall). (Page 114.)

FIGURE 9. Left valve. Vict. Mem. Mus., Cat. No. 5615, plesiotype.

Pterinea twenhofeli n. sp. (Page 116.)

FIGURE 10. Left valve. Vict. Mem. Mus., Cat. No. 6036, holotype.

Pterinea prominiradiata n. sp. (Page 114.)

FIGURE 11. Left valve. Vict. Mem. Mus., Cat. No. 5618, holotype.

Pterinea cancellata (Hall). (Page 115.)

FIGURE 12. Left valve. Vict. Mem. Mus., Cat. No. 5616, plesiotype.

Arisaigia placida (Billings). (Page 109.)

FIGURE 13. Right valve. Vict. Mem. Mus., Cat. No. 3128, holotype.

Arisaigia postornata var. *brevis* n. var. (Page 108.)

FIGURE 14. Enlarged X 2. Peabody Mus., Yale Univ., Cat. No. 487, holotype.

Arisaigia placida var. *socialis* (Billings). (Page 109.)

FIGURE 15. Left valve. Vict. Mem. Mus., Cat. No. 5611, plesiotype.

Arisaigia placida (Billings). (Page 109.)

FIGURE 16. Right valve. Intermediate towards var. *socialis*. Vict. Mem. Mus., Cat. No. 5610, plesiotype.

Tropinuculites carinatus (Hall). (Page 110.)

FIGURE 17. Right valve. Vict. Mem. Mus., Cat. No. 5613, plesiotype.

Arisaigia placida var. *socialis* (Billings). (Page 109.)

FIGURE 18. Left valve. Vict. Mem. Mus., Cat. No. 5612, plesiotype.

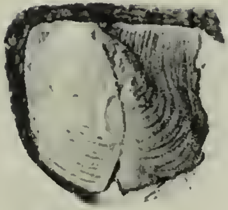
Arisaigia postornata McLearn. (Page 108.)

FIGURE 19. Left valve. Vict. Mem. Mus., Cat. No. 5608, holotype.

Tropinuculites carinatus (Hall). (Page 110.)

FIGURE 20. Right valve. Vict. Mem. Mus., Cat. No. 5614, plesiotype. For enlarged drawing *See* Pl. XXX, fig. 10.

Plate No. XIV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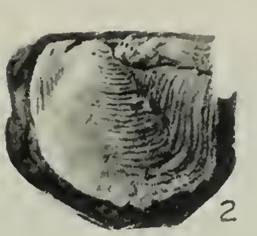
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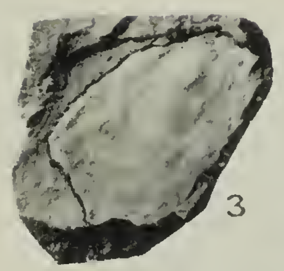
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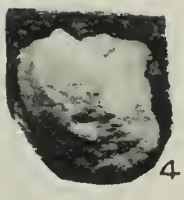
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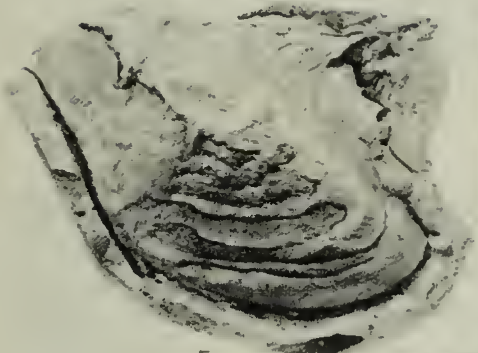
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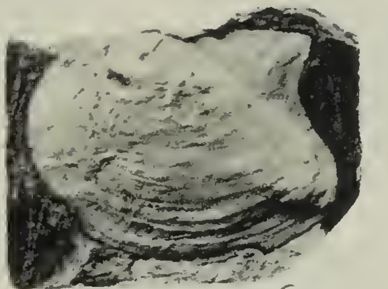
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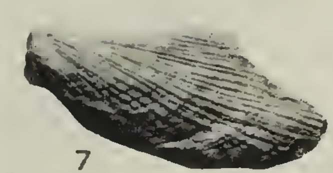
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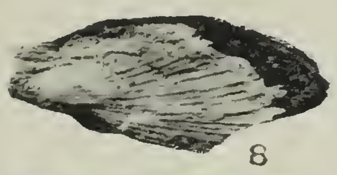
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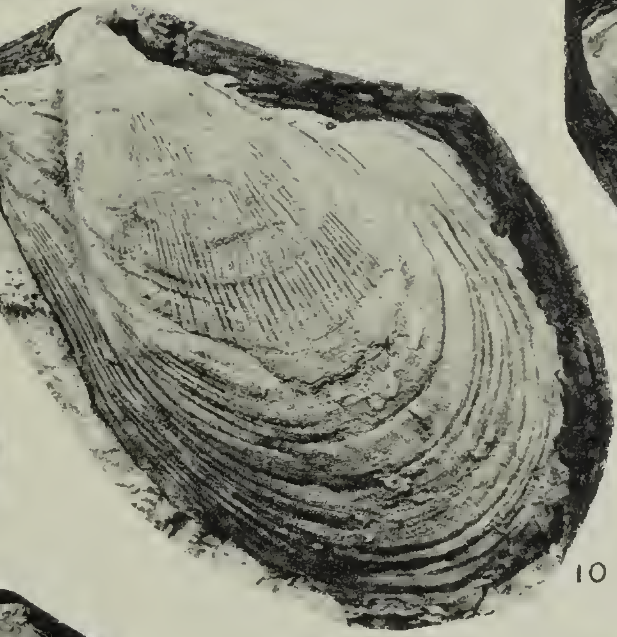
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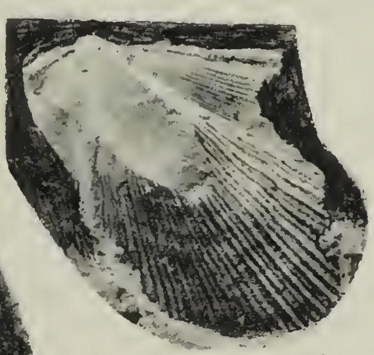
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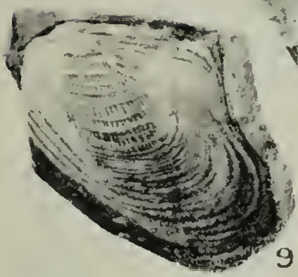
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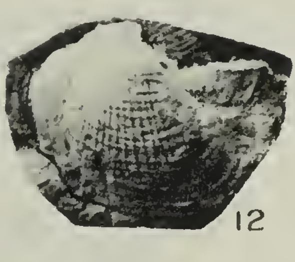
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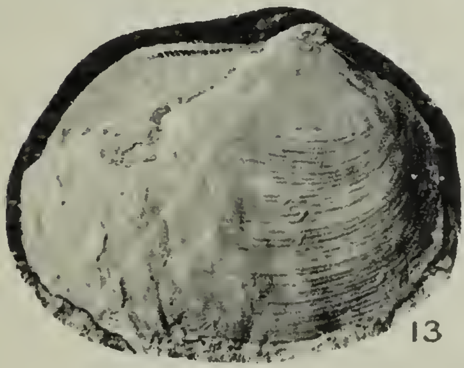
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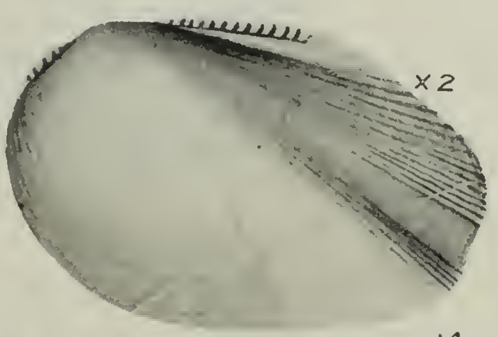
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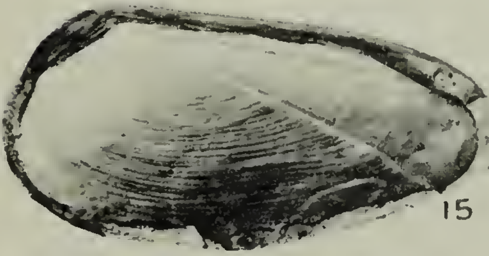
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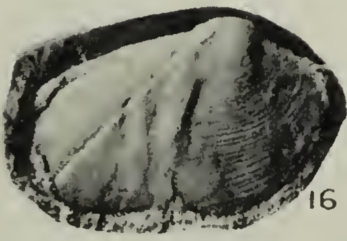
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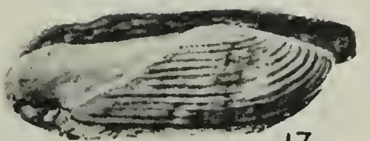
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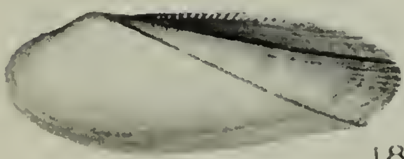
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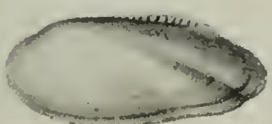
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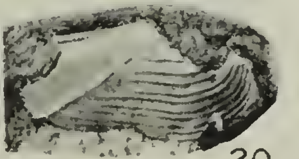
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PLATE XV

Pteronitella venusta Billings. (Page 119.)

FIGURE 1. Mould of interior of right valve. Vict. Mem. Mus., Cat. No. 5621, plesiotype.

Pteronitella curta Billings. (Page 121.)

FIGURE 2. Mould of interior of right valve. Vict. Mem. Mus., Cat. No. 5625, plesiotype.

Pteronitella venusta Billings. (Page 119.)

FIGURE 3. Left valve. Vict. Mem. Mus., Cat. No. 3133, cotype.
FIGURE 4. Left valve. Vict. Mem. Mus., Cat. No. 5622, plesiotype.

Pterinea honeymani (Hall). (Page 114.)

FIGURE 5. Right valve. Vict. Mem. Mus., Cat. No. 5617, plesiotype.

Pteronitella altiformis n. sp. (Page 122.)

FIGURE 6. Mould of interior of right valve. Vict. Mem. Mus., Cat. No. 5626, holotype.

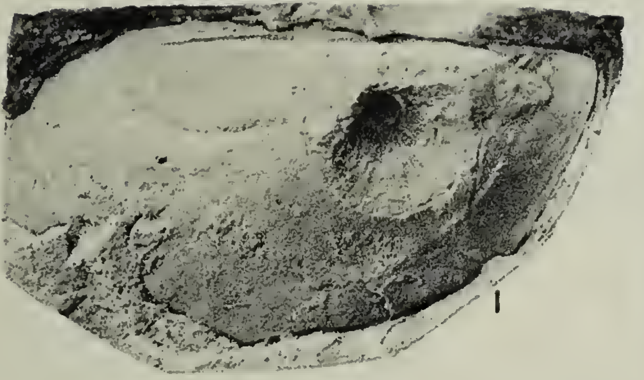
Palaeopecten danbyi (McCoy). (Page 119.)

FIGURE 7. Left valve. Vict. Mem. Mus., Cat. No. 5620, plesiotype.

Pteronitella compressiformis n. sp. (Page 122.)

FIGURE 8. Right valve. Peabody Mus., Yale Univ., Cat. No. 453, holotype.

Plate No. XV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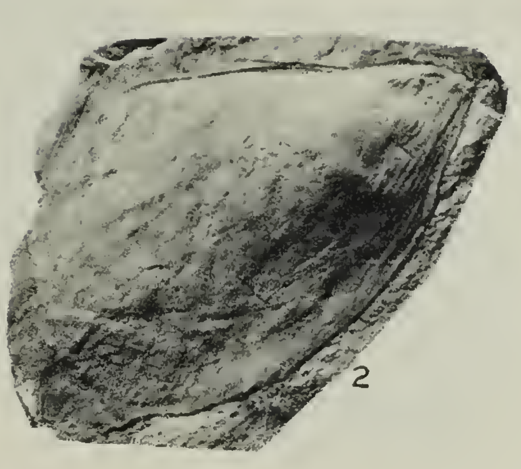
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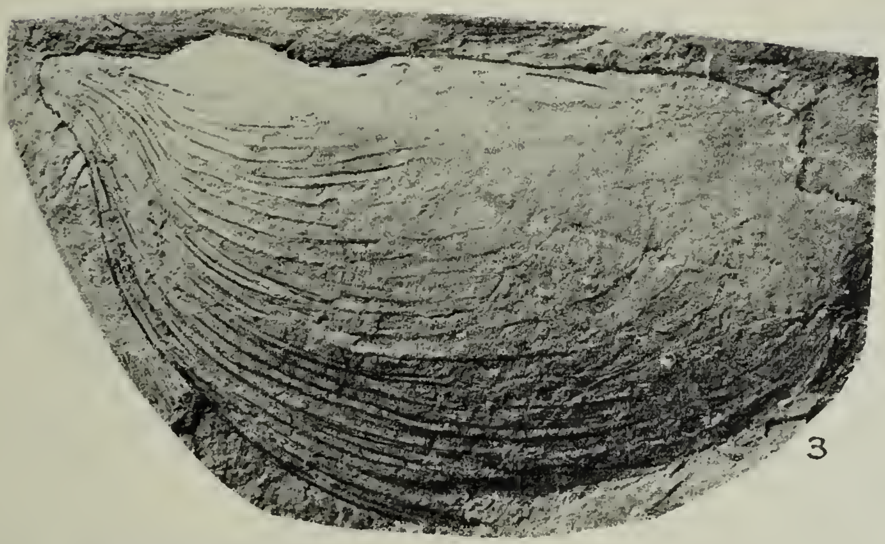
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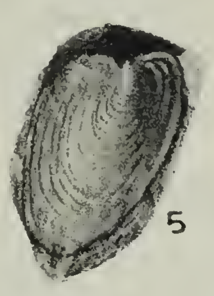
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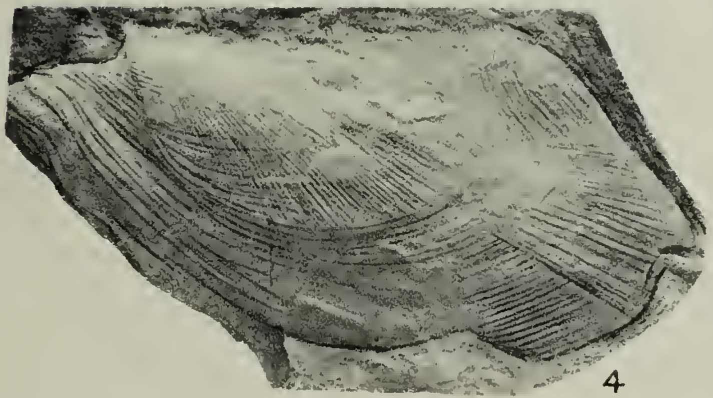
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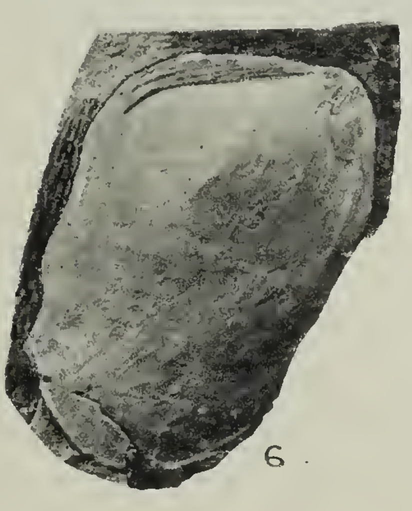
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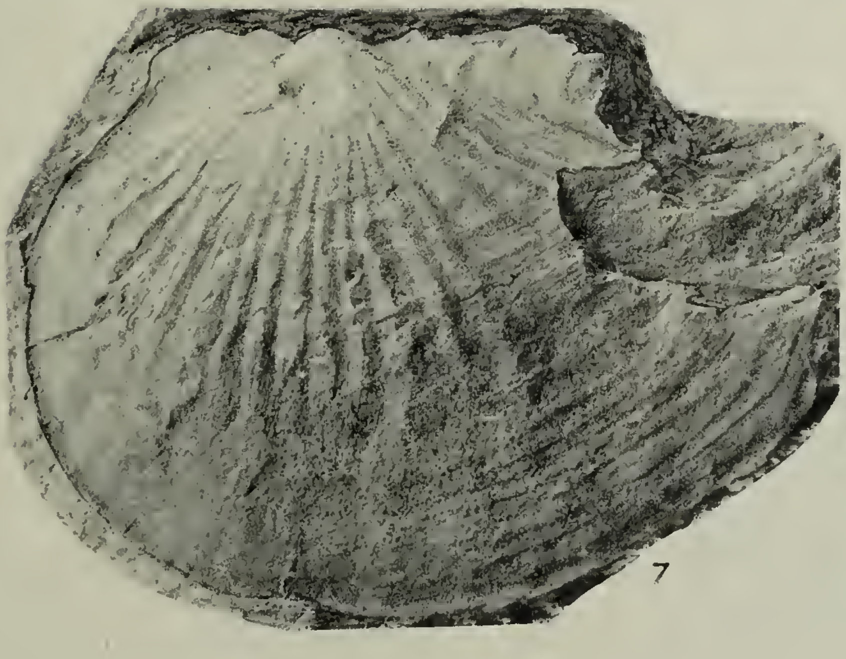
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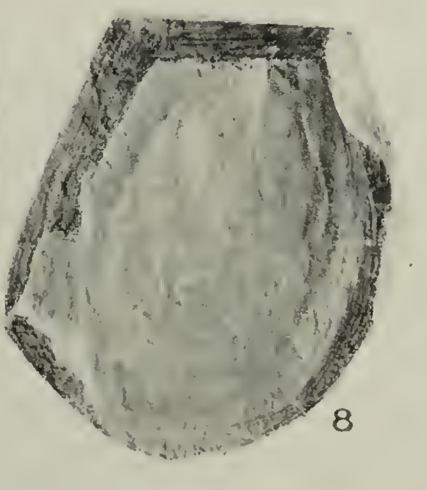
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Plate XVI

Pteronitella? sp.

Figure 1. Mould of interior of right valve. Vict. Mem. Mus., Cat. No. 6214, paratype.

Pteronitella (?) *beechhillensis* n. sp. (Page 122.)

Figure 2. Mould of interior of left valve. Vict. Mem. Mus., Cat. No. 6213, holotype.

Pteronitella venusta var. *oblonga* (Billings). (Page 120.)

Figure 3. Left valve. Peabody Mus., Yale Univ., Cat. No. 453a, plesiotype.

Modiolopsis rossonia n. sp. (Page 128.)

Figure 4. Left valve. Peabody Mus., Yale Univ., Cat. No. 454, holotype.

Pteronitella venusta var. *oblonga* (Billings). (Page 120.)

Figure 5. Exterior left valve, with radiating striæ. Vict. Mem. Mus., Cat. No. 5624, plesiotype.

Modiolopsis rossonia n. sp. (Page 128.)

Figure 6. Mould of interior of left valve. Peabody Mus., Yale Univ., Cat. No. 454a, paratype.

Pteronitella venusta var. *oblonga* (Billings). (Page 120.)

Figure 7. Left valve. Vict. Mem. Mus., Cat. No. 5623, plesiotype.

Figure 8. From the McAdam. Left valve. Peabody Mus., Yale Univ., Cat. No. 453b, plesiotype.

Pteronitella? sp.

Figure 9. Mould of interior of left valve. Vict. Mem. Mus., Cat. No. 6215, paratype.

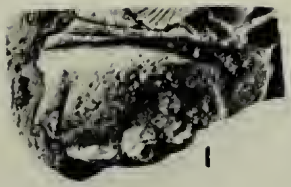
Pterinea marklandensis n. sp. (Page 116.)

Figure 10. Left valve. Vict. Mem. Mus., Cat. No. 6037, holotype.

Pterinea stonehousensis n. sp. (Page 117.)

Figure 11. Left valve. Peabody Mus., Yale Univ., Cat. No. 455, holotype.

Plate No. XVI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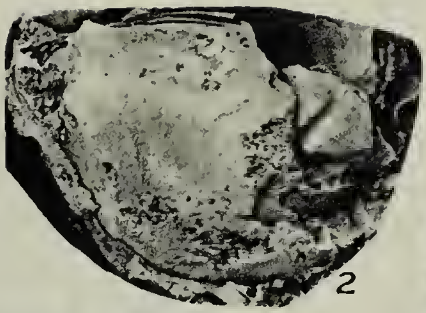
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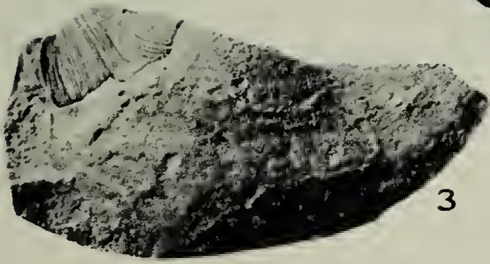
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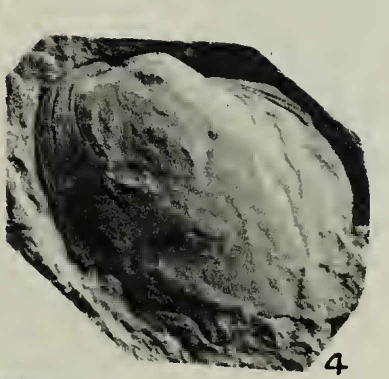
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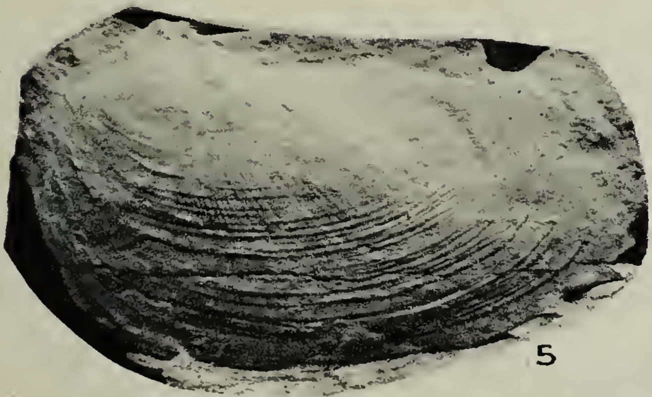
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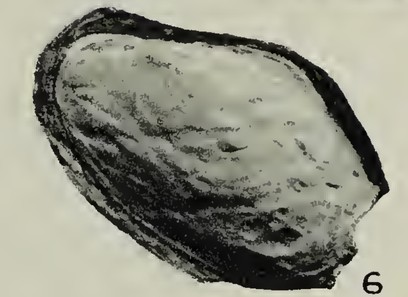
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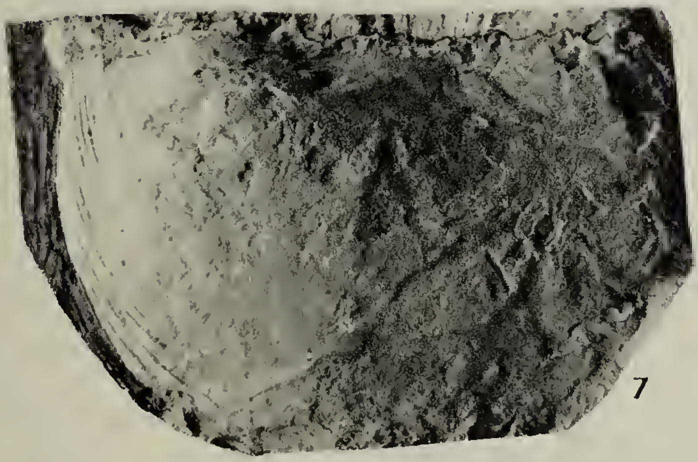
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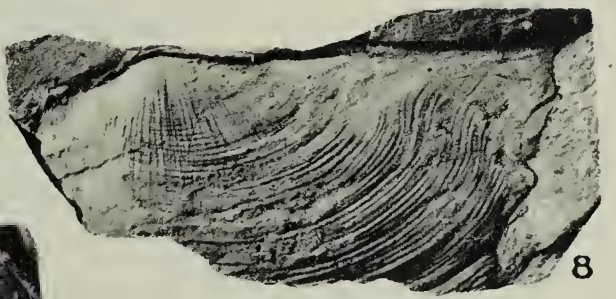
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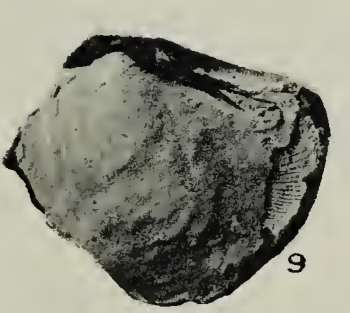
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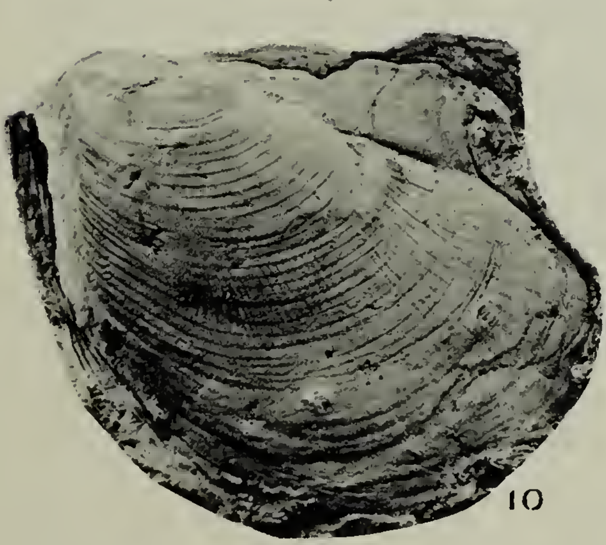
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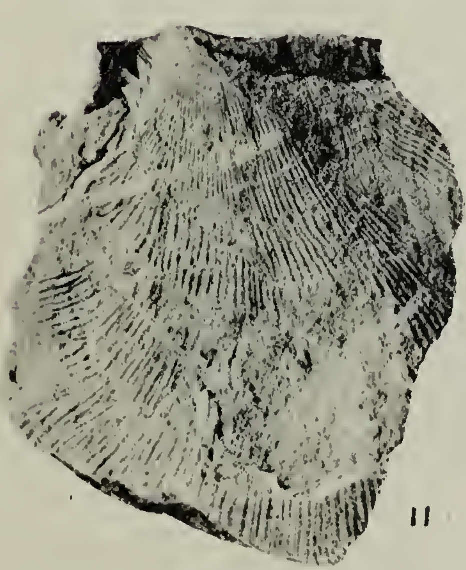
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Plate XVII

Goniophora consimilis Billings. (Page 129.)
Figure 1. Left valve. Vict. Mem. Mus., Cat. No. 3125, holotype.

Pterinea stonehousensis n. sp. (Page 117.)
Figure 2. Left valve. Vict. Mem. Mus., Cat. No. 6041, paratype.

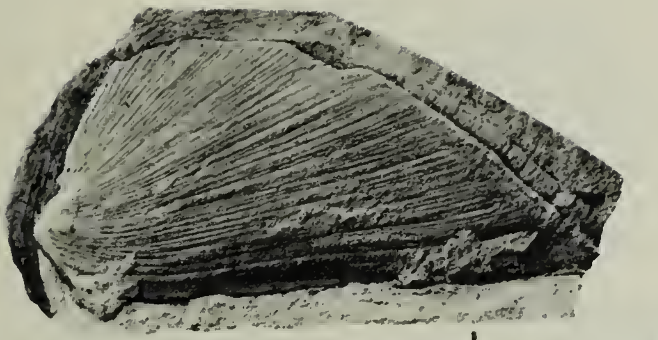
Pterinea honeymani (Hall). (Page 114.)
Figure 3. Left valve. Vict. Mem. Mus., Cat. No. 3111d, plesiotype.

Pterinea gesneri n. sp. (Page 117.)
Figure 4. Left valve. Vict. Mem. Mus., Cat. No. 6038, holotype.

Pterinea amii n. sp. (Page 116.)
Figure 5. Left valve. Vict. Mem. Mus., Cat. No. 6039, holotype.

Pterinea stonehousensis n. sp. (Page 117.)
Figure 6. Left valve. Peabody Mus., Yale Univ., Cat. No. 455a, paratype.

Pterinea northumberlandensis n. sp. (Page 117.)
Figure 7. Left valve. Peabody Mus., Yale Univ., Cat. No. 488, holotype.



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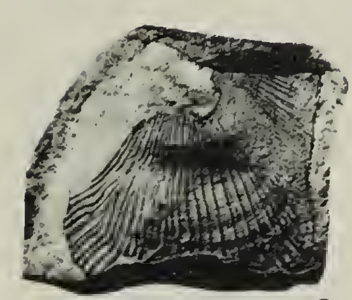

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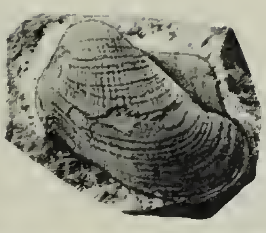

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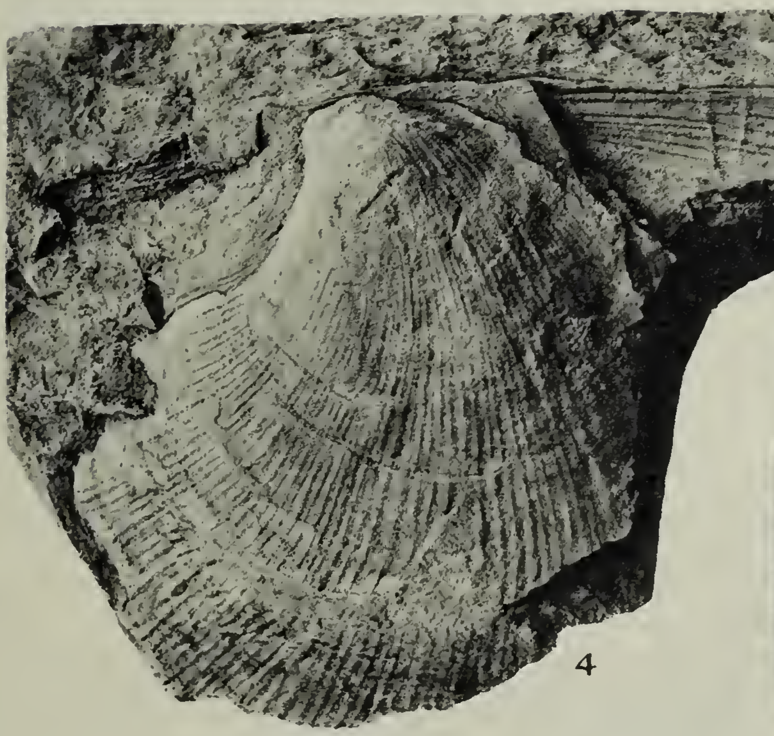

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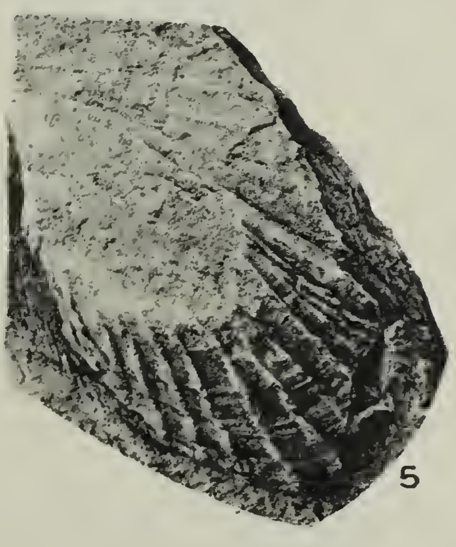

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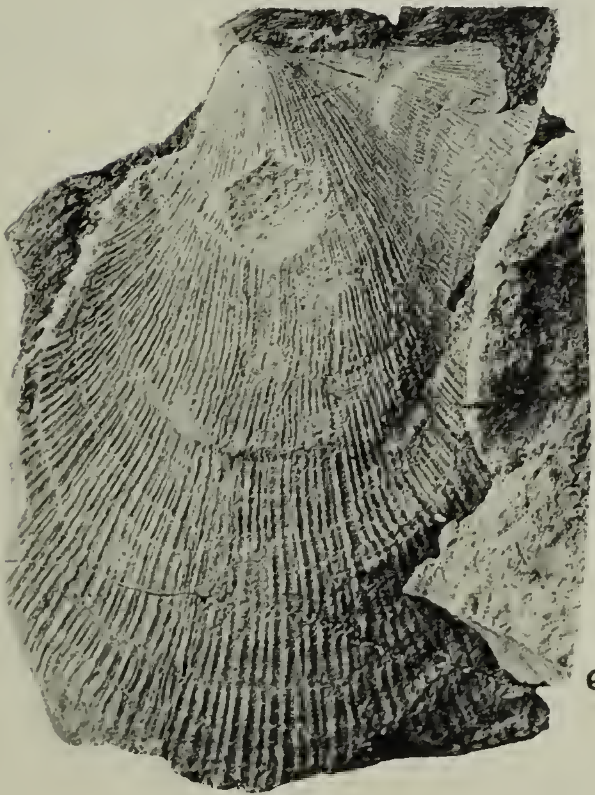

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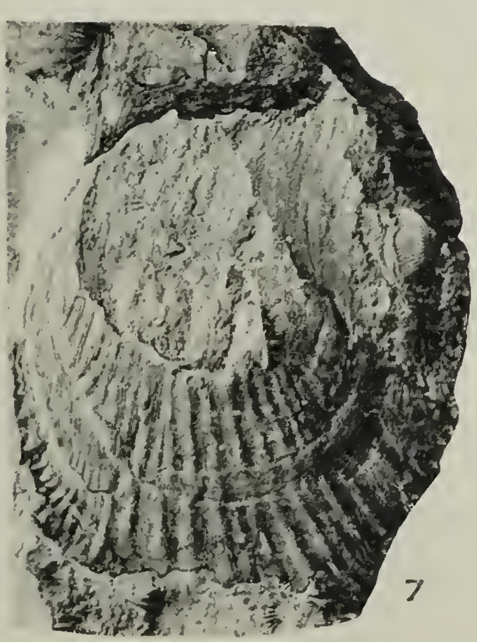

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PLATE XVIII

Goniophora consimilis Billings. (Page 129.)

FIGURE 1. Elongate form. Right valve. Vict. Mem. Mus., Cat. No. 5628, plesiotype.

FIGURE 2. Short, high form. Left valve. Vict. Mem. Mus., Cat. No. 5627, plesiotype. For drawing *See* Pl. XXIX, fig. 10.

FIGURE 3. Same specimen, view from above.

Goniophora mediocris Billings. (Page 130.)

FIGURE 4. Left valve. Vict. Mem. Mus., Cat. No. 5629, plesiotype. For drawing *See* Pl. XXIX fig. 13.

FIGURE 5. Same specimen, viewed from above.

Goniophora laticostata n. sp. (Page 130.)

FIGURE 6. Left valve. Peabody Mus., Yale Univ., Cat. No. 456, holotype.

Goniophora transiens Billings. (Page 131.)

FIGURE 7. Left valve. Vict. Mem. Mus., Cat. No. 3122a, plesiotype. For drawing *See* Pl. XXIX, fig. 8.

FIGURE 8. Right valve. Vict. Mem. Mus., Cat. No. 5630, plesiotype.

Goniophora montsi n. sp. (Page 132.)

FIGURE 9. Left valve. Peabody Mus., Yale Univ., Cat. No. 456a, holotype.

Cosmogoniophora bellula (Billings). (Page 132.)

FIGURE 10. Left valve. Vict. Mem. Mus., Cat. No. 5631, plesiotype.

Cosmogoniophora bellula var. *elongata* n. var. (Page 133.)

FIGURE 11. Right valve. Vict. Mem. Mus., Cat. No. 5632, holotype.

Modiolopsis haliburtoni n. sp. (Page 124.)

FIGURE 12. Right valve. Peabody Mus., Yale Univ., Cat. No. 457, holotype.

Cosmogoniophora bellula (Billings). (Page 132.)

FIGURE 13. Right valve. Vict. Mem. Mus., Cat. No. 3124, holotype.

Modiolopsis exilis Billings. (Page 125.)

FIGURE 14. Left valve of short form. Vict. Mem. Mus., Cat. No. 5634, plesiotype.

PIGURE 15. Long form. Left valve. Peabody Mus., Yale Univ., Cat. No. 489, plesiotype.

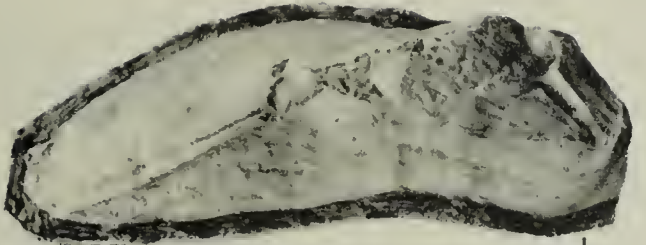
Pteronitella compressiformis n. sp. (Page 122.)

FIGURE 16. Mould of interior of right valve. Peabody Mus., Yale Univ., Cat. No. 453c, paratype.

Modiolopsis exilis Billings. (Page 125.)

FIGURE 17 Right valve. Low, elongate form. Vict. Mem. Mus., Cat. No. 3099, cotype.

Plate No. XVIII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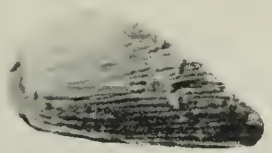
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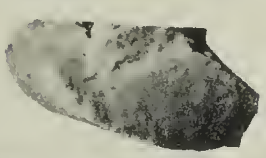
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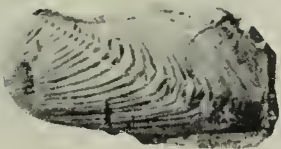
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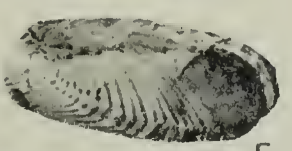
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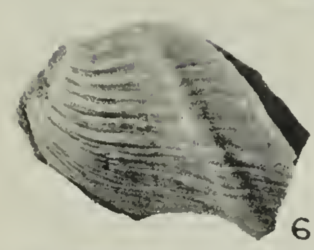
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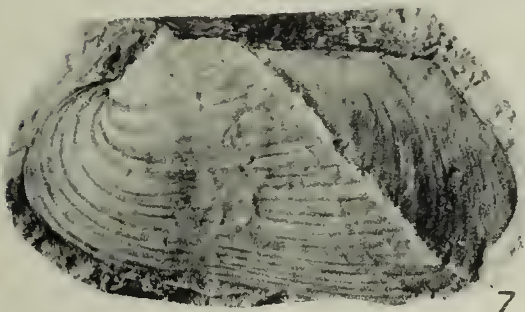
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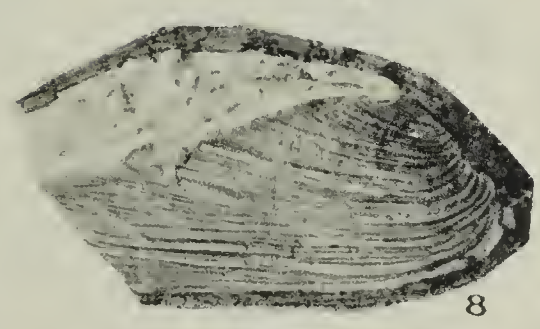
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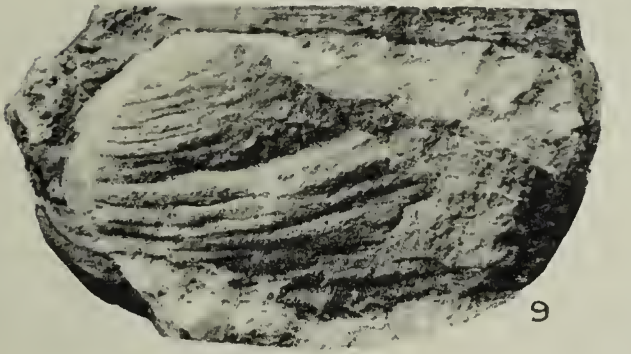
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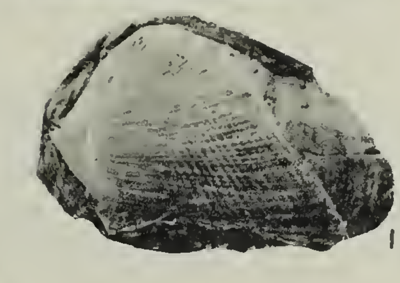
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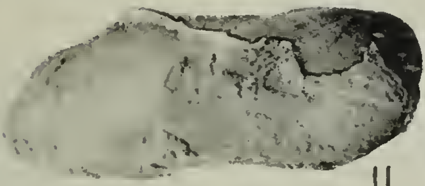
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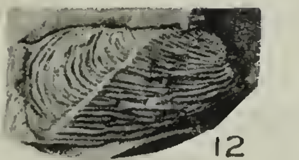
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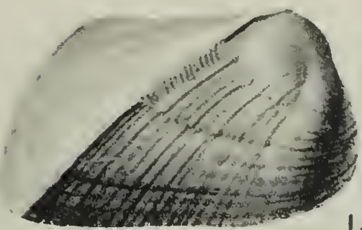
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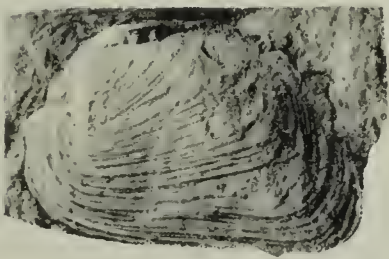
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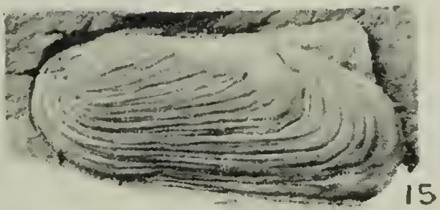
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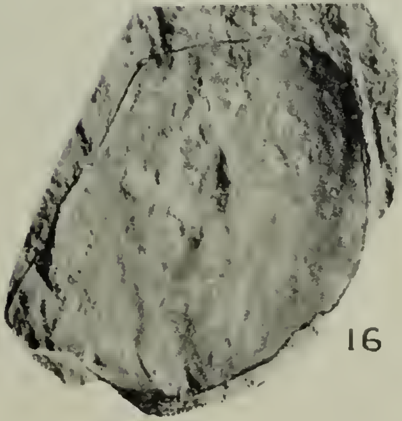
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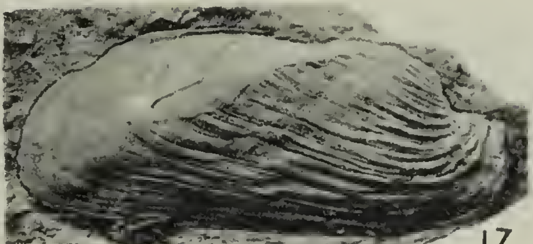
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Plate XIX

Modiolopsis rhomboidea var. *subnasuta* (Hall). (Page 127.)

Figure 1. Left valve. Vict. Mem. Mus., Cat. No. 5637, plesiotype.

Modiolopsis latouri n. sp. (Page 128.)

Figure 2. Left valve. Vict. Mem. Mus., Cat. No. 6034, holotype.

Modiolopsis sp. (Page 128.)

Figure 3. Vict. Mem. Mus., Cat. No. 6033.

Modiolopsis rhomboidea Hall. (Page 126.)

Figure 4. Mould of interior of right valve. Vict. Mem. Mus., Cat. No. 5635, plesiotype.

Orthonota pressiornata n. sp. (Page 137.)

Figure 5. Right valve. Peabody Mus., Yale Univ., Cat. No. 458, holotype.

Orthonota arisaigensis n. sp. (Page 135.)

Figure 6. Right valve. Vict. Mem. Mus., Cat. No. 5639, holotype.

Modiolopsis rhomboidea var. *eurymyellaformis* n. var. (Page 127.)

Figure 7. Right valve. Vict. Mem. Mus., Cat. No. 5636, holotype.

Orthonota arisaigensis n. sp. (Page 135.)

Figure 8. Both valves. Peabody Mus., Yale Univ., Cat. No. 458a, paratype.

Figure 9. Left valve. Vict. Mem. Mus., Cat. No. 5638, paratype.

Orthonota angulifera (McCoy). (Page 136.)

Figure 10. Right valve. Vict. Mem. Mus., Cat. No. 5641, plesiotype.

Orthonota venusta Billings. (Page 135.)

Figure 11. Left valve. Vict. Mem. Mus., Cat. No. 3118, holotype.

Orthonota simulans Billings. (Page 138.)

Figure 12. Left valve. Vict. Mem. Mus., Cat. No. 5642, plesiotype.

Orthonota proundulata n. sp. (Page 134.)

Figure 13. Left valve. Vict. Mem. Mus., Cat. No. 5640, holotype.

Orthonota incerta Billings. (Page 137.)

Figure 14. Left valve. Vict. Mem. Mus., Cat. No. 3119, holotype.

Orthonota simulans Billings. (Page 138.)

Figure 15. Right valve. Vict. Mem. Mus., Cat. No. 3117, holotype.

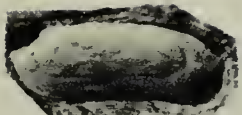
Modiolopsis exilis Billings. (Page 125.)

Figure 16. Right valve of quite high and long form. Vict. Mem. Mus., Cat. No. 3099a, cotype.

Grammysia ? speciosa Billings. (Page 95.)

Figure 17. Right valve. Vict. Mem. Mus., Cat. No. 3121, cotype.

Plate No. XIX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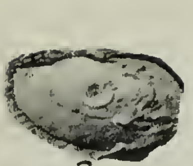
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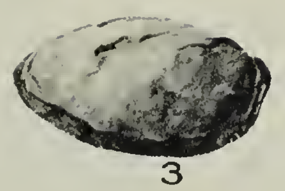
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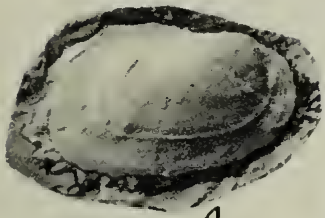
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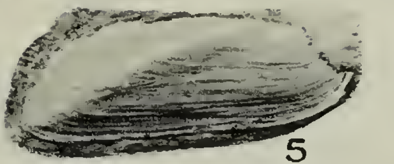
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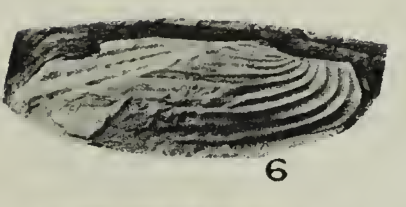
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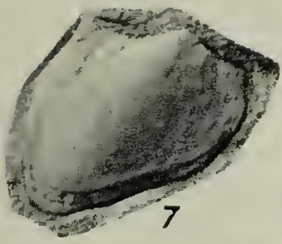
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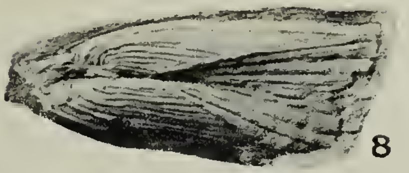
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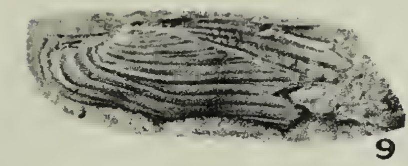
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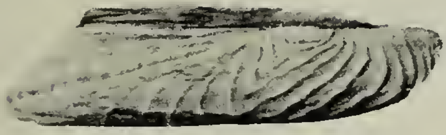
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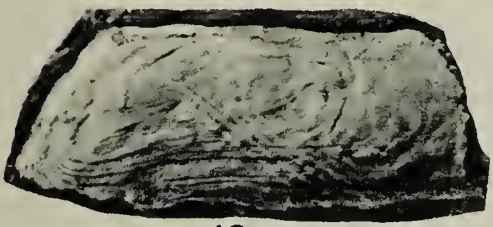
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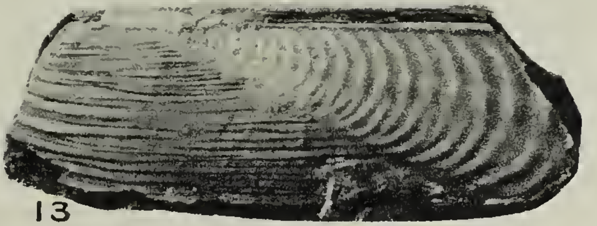
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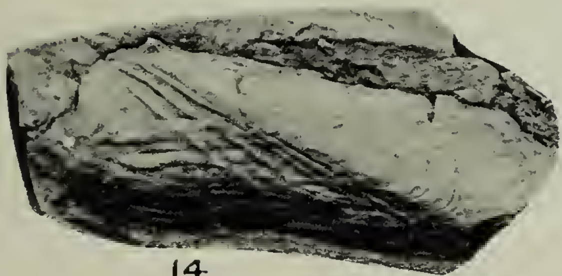
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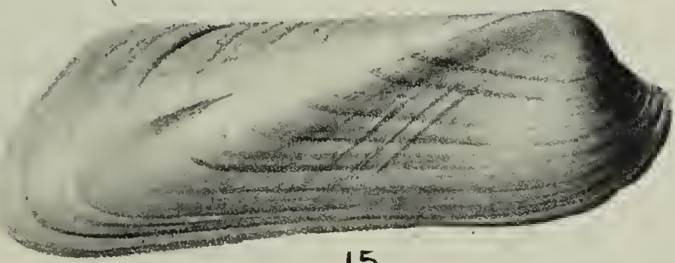
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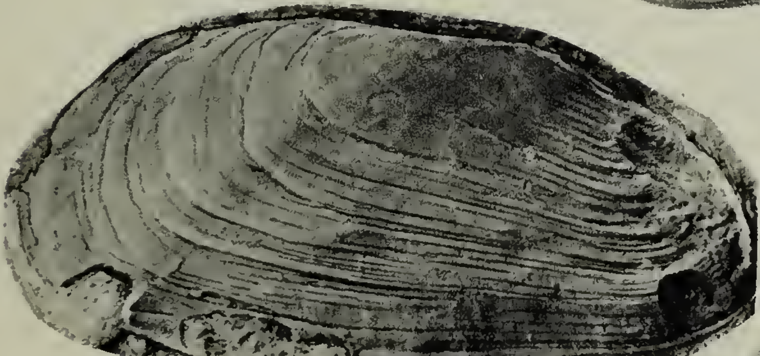
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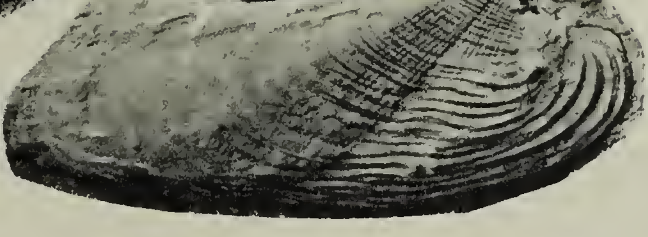
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PLATE XX

Palaeosolen antigonishensis n. sp. (Page 139.)

FIGURE 1. Left valve. Vict. Mem. Mus., Cat. No. 6025, holotype.

Palaeosolen amii n. sp. (Page 140.)

FIGURE 2. Left valve. Vict. Mem. Mus., Cat. No. 6026, holotype.

Orthodesma ? sp. (Page 133.)

FIGURE 3. Right valve. Vict. Mem. Mus., Cat. No. 459.

Paracyclas fletcheri n. sp. (Page 139.)

FIGURE 4. A small Ross Brook form with subcentral beak. Peabody Mus., Yale Univ., Cat. No. 460, paratype.
FIGURE 5. From McAdam formation. Peabody Mus., Yale Univ., Cat. No. 460a, paratype.
FIGURE 6. From Moydart formation. Peabody Mus., Yale Univ., Cat. No. 460b, paratype.
FIGURE 7. A low form from the Stonehouse. Vict. Mem. Mus., Cat. No. 5646, paratype.
FIGURE 8. From the Stonehouse. Vict. Mem. Mus., Cat. No. 5644, holotype.
FIGURE 9. Central beak, depressed form. From the Stonehouse, Vict. Mem. Mus., Cat. No. 5643, paratype.
FIGURE 10. Beak anterior to the middle. Vict. Mem. Mus., Cat. No. 5645, paratype.

Leda megumaensis n. sp. (Page 111.)

FIGURE 11. Right valve. Peabody Mus., Yale Univ., Cat. No. 461, holotype.

Palaeocardia ? woodmani n. sp. (Page 123.)

FIGURE 12. Vict. Mem. Mus., Cat. No. 6030, holotype.

Bucania sp. (Page 141.)

FIGURE 13. Vict. Mem. Mus., Cat. No. 6216.
FIGURE 14. The same specimen. Side view.

Mytilarca sp. (Page 123.)

FIGURE 15. Peabody Mus., Yale Univ., Cat. No. 478.

Mytilarca amii n. sp. (Page 123.)

FIGURE 16. Peabody Mus., Yale Univ., Cat. No. 461a, holotype.

Bucanopsis sp. (Page 141.)

FIGURE 17. Vict. Mem. Mus., Cat. No. 3140c.

Plectonotus trilobatus (Sowerby). (Page 140.)

FIGURE 18. Vict. Mem. Mus., Cat. No. 3138, plesiotype.

Orthoceras bullatum var. *pictoense* (Dawson). (Page 155.)

FIGURE 19. Surface spec. Pl. XXIV, fig. 9 X 2. Drawing.

Bucanopsis ? sp. (Page 141.)

FIGURE 20. Vict. Mem. Mus., Cat. No. 3140.

Goniostropha aciculata (Hall). (Page 142.)

FIGURE 21. Vict. Mem. Mus., Cat. No. 5651, plesiotype.

Hormotoma amii n. sp. (Page 143.)

FIGURE 22. Vict. Mem. Mus., Cat. No. 5652, holotype.

Liospira marklandensis n. sp. (Page 144.)

FIGURE 23. Side view. Vict. Mem. Mus., Cat. No. 5654, holotype.
FIGURE 24. The same specimen. View from above.

Goniostropha aciculata (Hall). (Page 142.)

FIGURE 25. Vict. Mem. Mus., Cat. No. 5650, plesiotype.

Liospira cf. *affinis* (Foerste). (Page 144.)

FIGURE 26. Side view. Peabody Mus., Yale Univ., Cat. No. 480, holotype.
FIGURE 27. Same specimen, view from above.

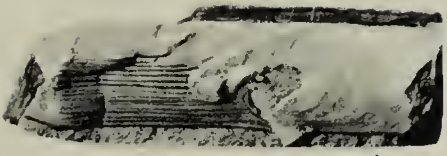
Bellerophon sp. (Page 141.)

FIGURE 28. Peabody Mus., Yale Univ., Cat. No. 462.
FIGURE 29. Same specimen. Side view.

Plectonotus trilobatus (Sowerby). (Page 140.)

FIGURE 30. Narrow variety. Peabody Mus., Yale Univ., Cat. No. 479, plesiotype.
FIGURE 31. Same specimen. Side view.
FIGURE 32. Vict. Mem. Mus., Cat. No. 5649, plesiotype.

Plate No. XX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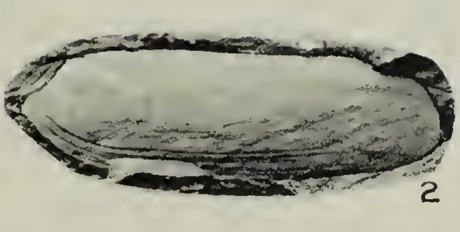
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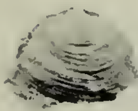
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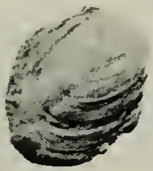
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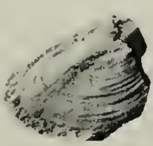
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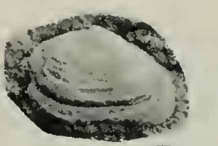
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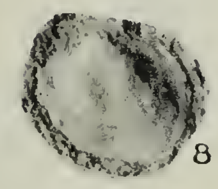
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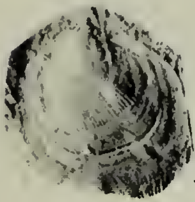
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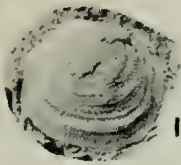
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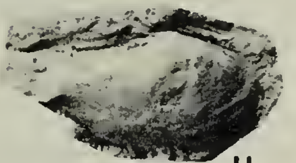
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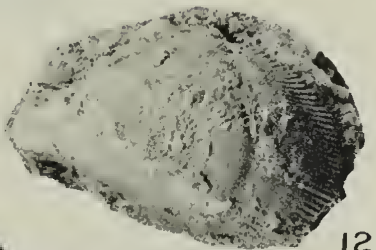
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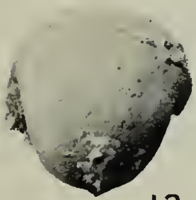
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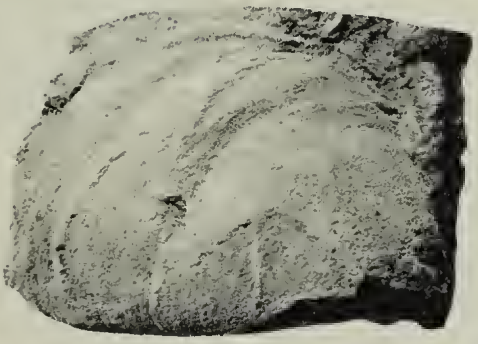
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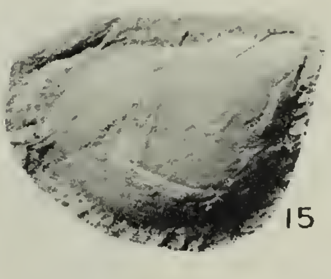
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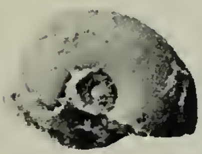
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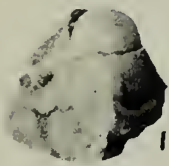
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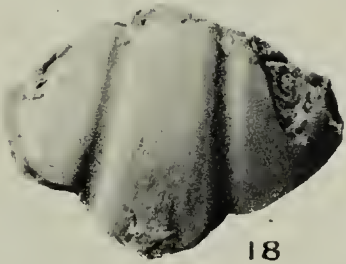
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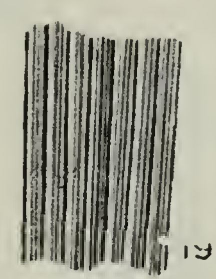
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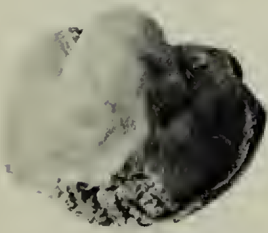
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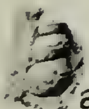
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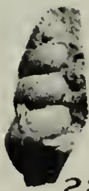
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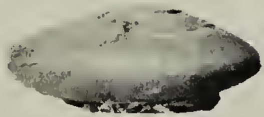
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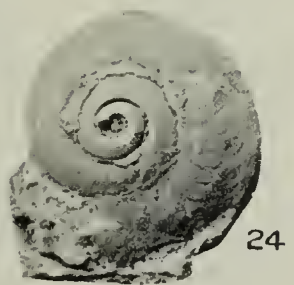
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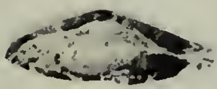
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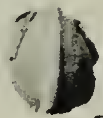
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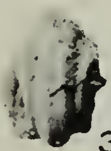
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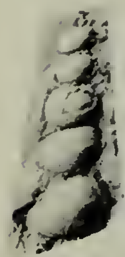
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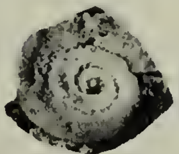
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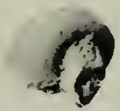
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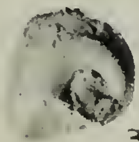
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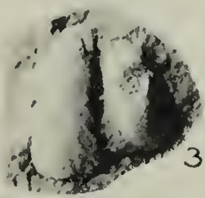
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Plate XXI

Holopea caecistriata n. sp. (Page 147.)

Figure 1. Vict. Mem. Mus., Cat. No. 5656, holotype.

Holopea ? sp. (Page 148.)

Figure 2. Peabody Mus., Yale Univ., Cat. No. 462a.

Cyclonema haliburtoni n. sp. (Page 147.)

Figure 3. Peabody Mus., Yale Univ., Cat. No. 462b, holotype.

Tentaculites canadensis var. *obtusiformis* n. var. (Page 151.)

Figure 4. Vict. Mem. Mus., Cat. No. 5659, holotype.

Tentaculites canadensis Ami. (Page 150.)

Figure 5. Peabody Mus., Yale Univ., Cat. No. 463, plesiotype.
Figure 6. Peabody Mus., Yale Univ., Cat. No. 463a, plesiotype.

Hyolithes forbesi (Sharpe). (Page 149.)

Figure 7. Vict. Mem. Mus., Cat. No. 5658, plesiotype.

Diaphorostoma cornutum var. *arisaigensis* n. var. (Page 148.)

Figure 8. View from above. Vict. Mem. Mus., Cat. No. 5657, holotype.
Figure 9. Same specimen. Side view.
Figure 10. Same specimen. Side view.

Seelya moydartensis n. sp. (Page 145.)

Figure 11. Peabody Mus., Yale Univ., Cat. No. 464, holotype.
Figure 12. Peabody Mus., Yale Univ., Cat. No. 464a, paratype.

Cyclonema parvimedium n. sp. (Page 146.)

Figure 13. Side view. Vict. Mem. Mus., Cat. No. 5655, holotype.
Figure 14. The same specimen. Enlargement X 10 of a part of surface.

Orthoceras arisaigense n. sp. (Page 157.)

Figure 15. Peabody Mus., Yale Univ., Cat. No. 465, paratype.
Figure 16. Peabody Mus., Yale Univ., Cat. No. 465a, holotype.

Orthoceras mcadamense n. sp. (Page 152.)

Figure 17. Peabody Mus., Yale Univ., Cat. No. 465b, holotype.
Figure 18. Same specimen. End view.

Orthoceras sp. (Page 154.)

Figure 19. Living chamber and septa. Peabody Mus., Yale Univ., Cat. No. 465c.

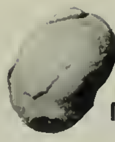
Orthoceras marklandense n. sp. (Page 154.)

Figure 20. Living chamber and septa. Vict. Mem. Mus., Cat. No. 5583, holotype.

Goniostropha ? sp. (Page 143.)

Figure 21. Peabody Mus., Yale Univ., Cat. No. 466.

Plate No. XXI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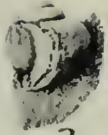
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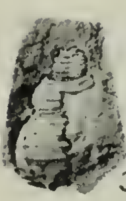
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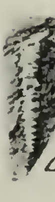
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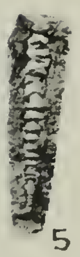
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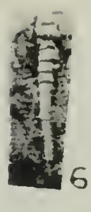
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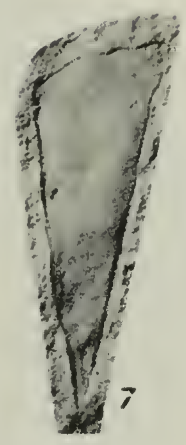
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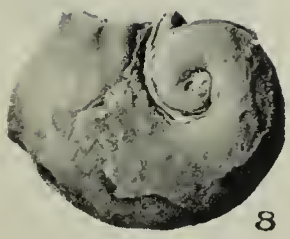
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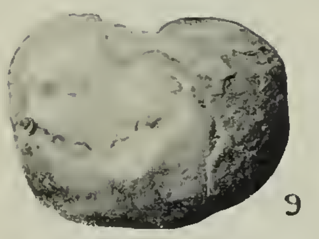
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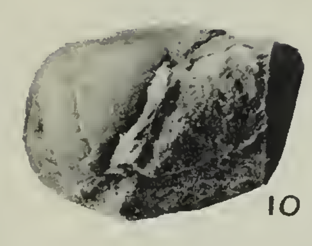
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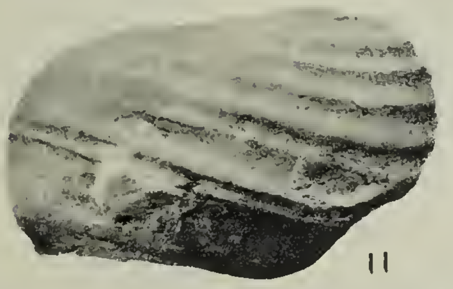
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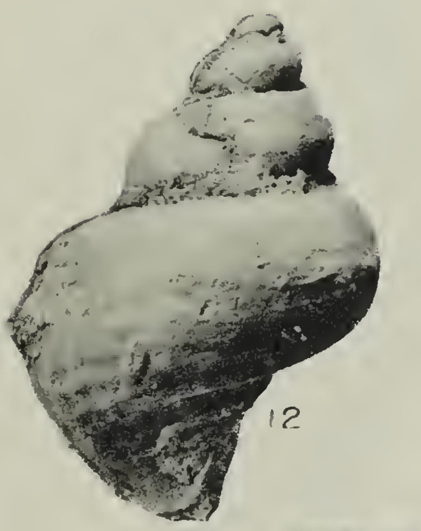
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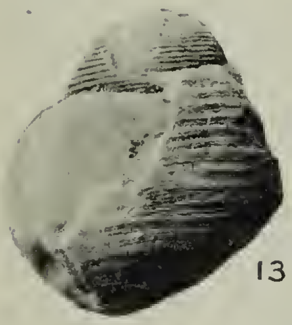
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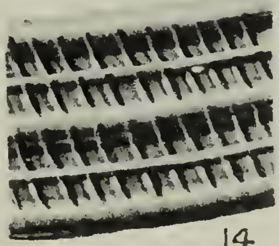

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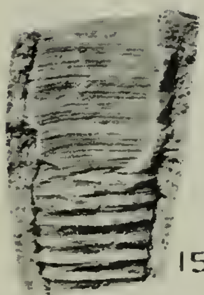
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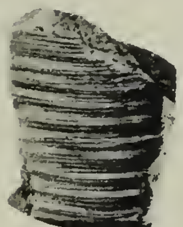
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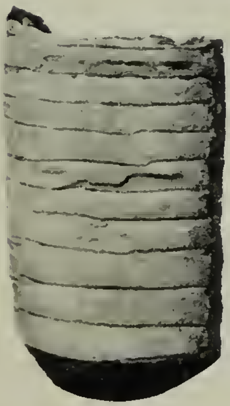
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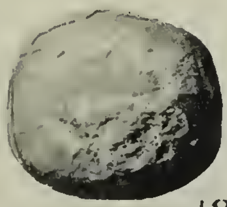
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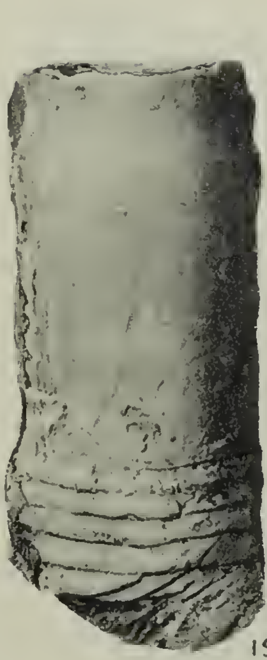
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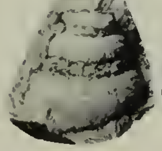
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PLATE XXII

Orthoceras ludense var. *camerini* n. var. (Page 152.)

FIGURE 1. Peabody Mus., Yale Univ., Cat. No. 467, paratype.
FIGURE 2. Same specimen. End view.
FIGURE 3. Peabody Mus., Yale Univ., Cat. No. 467a, paratype.
FIGURE 4. Same specimen. End view.
FIGURE 5. End view. Vict. Mem. Mus., Cat. No. 5660, holotype.
FIGURE 6. Same specimen.

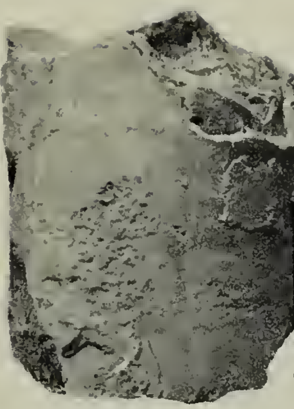
Orthoceras antigonishense n. sp. (Page 152.)

FIGURE 7. Peabody Mus., Yale Univ., Cat. No. 467b, paratype.
FIGURE 8. Distal end. Peabody Mus., Yale Univ., Cat. No. 467c, paratype.

Orthoceras punctostriatum Hall. (Page 153.)

FIGURE 9. Partly exfoliated, showing inner layers of shell. Peabody Mus., Yale Univ., Cat. No. 467d, plesiotype. For enlargement *See* Pl. XXIX, fig. 12.

Plate No. XXII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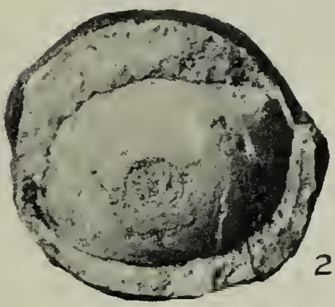
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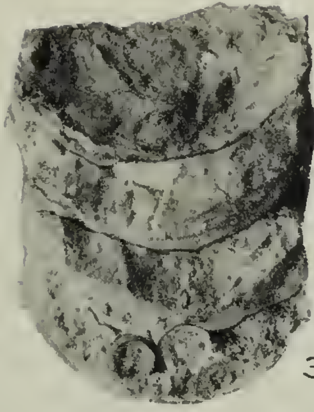
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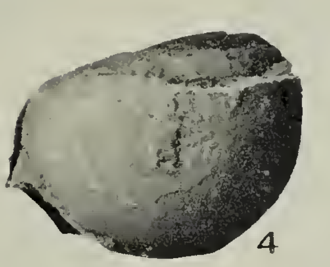
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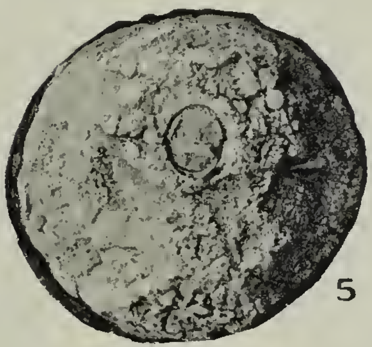
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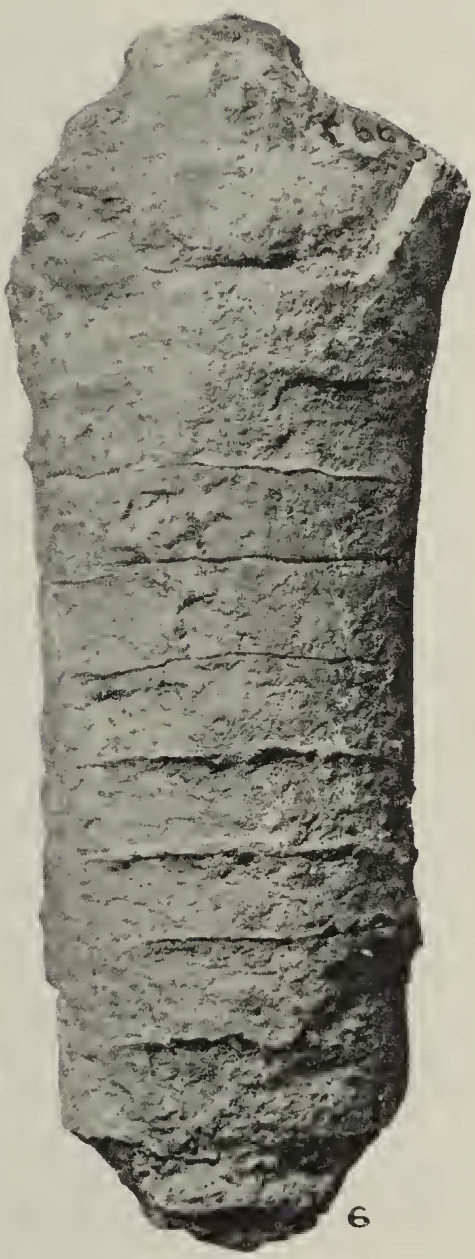
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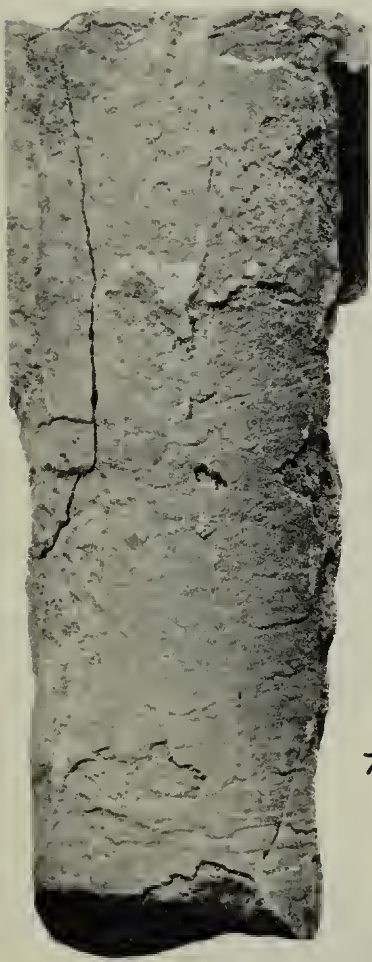
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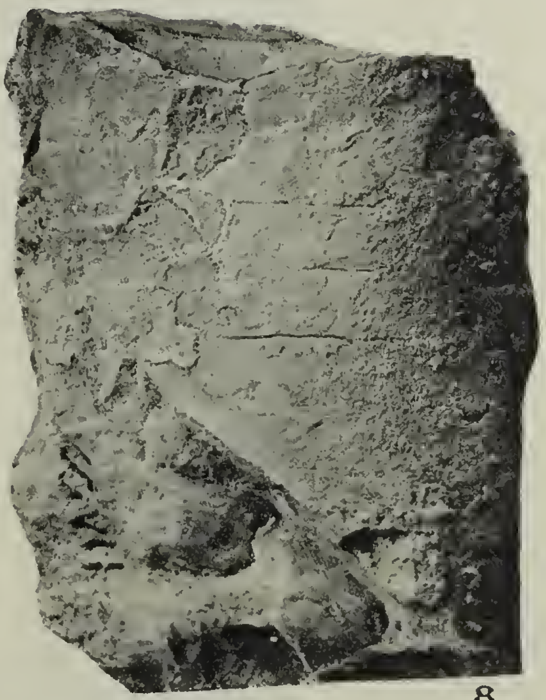
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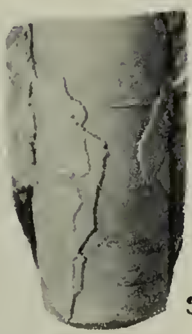
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PLATE XXIII

Orthoceras bullatum var. *pictoense* (Dawson). (Page 155.)

FIGURE 1. Distal end. Peabody Mus., Yale Univ., Cat. No. 467e, plesiotype.

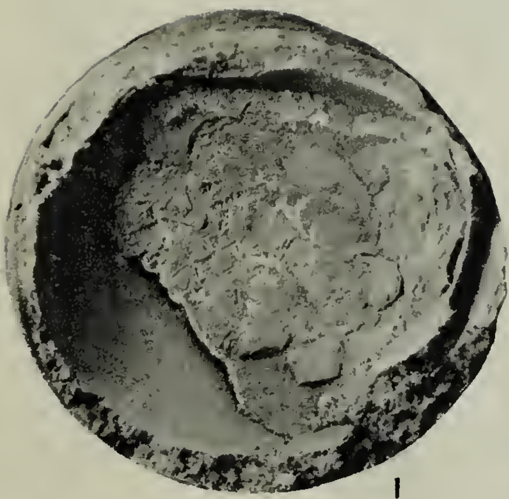
Orthoceras confertiseptatum n. sp. (Page 154.)

FIGURE 2. Peabody Mus., Yale Univ., Cat. No. 467f, holotype.
FIGURE 3. Same specimen. End view.

Orthoceras bullatum var. *pictoense* (Dawson). (Page 155.)

FIGURE 4. Same specimen as fig. 1.
FIGURE 5. Same specimen. Proximal end.

Plate No. XXIII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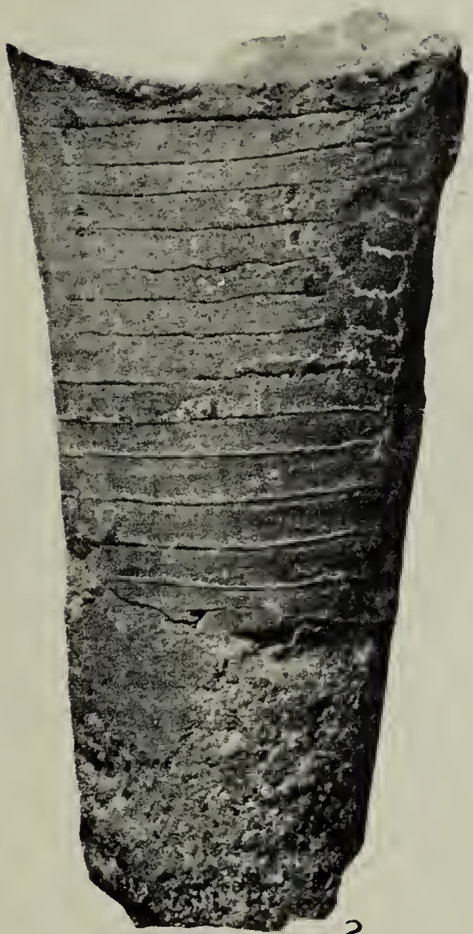
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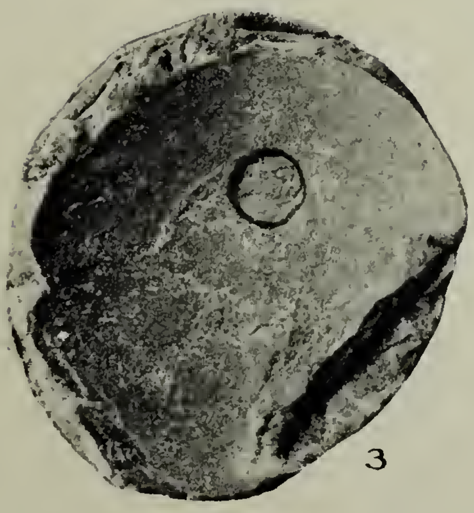
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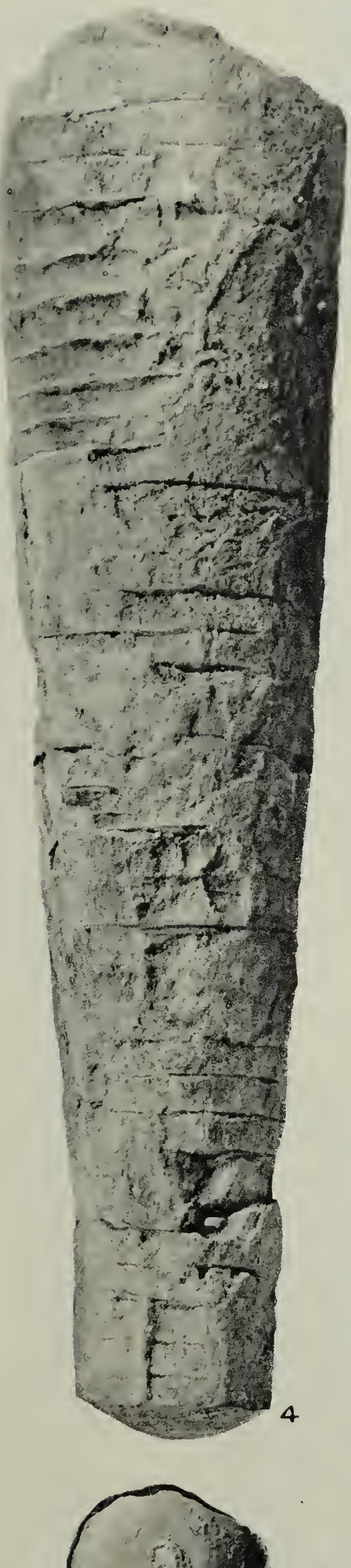
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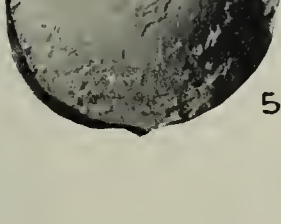
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PLATE XXIV

Dawsonoceras elegantulum (Dawson). (Page 156.)

FIGURE 1. Shell partly exfoliated. Vict. Mem. Mus., Cat. No. 5663, plesiotype. For enlargement *See* Pl. XXIX, fig. 7.
FIGURE 2. Peabody Mus., Yale Univ., Cat. No. 468, plesiotype.
FIGURE 3. Peabody Mus., Yale Univ., Cat. No. 468a, plesiotype.

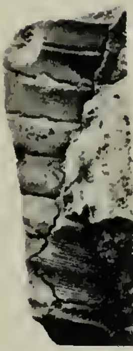
Kionoceras angulatum (Wahlenberg). (Page 157.)

FIGURE 4. Shell partly exfoliated, showing septa. Vict. Mem. Mus., Cat. No. 3144a, plesiotype.
FIGURE 5. The same specimen. Surface enlarged X 10.
FIGURE 6. Mould exterior. Vict. Mem. Mus., Cat. No. 5665, plesiotype. For enlargement *See* Pl. XXIX, fig. 4.
FIGURE 7. Shell partly exfoliated showing an inner layer and septa. Also shows surface ornamentation. Peabody Mus., Yale Univ., Cat. No. 469, plesiotype. For enlargement of inner layer, *See* Pl. XXVIII, fig. 15.
FIGURE 8. Tending toward *K. latouri* n. sp. Vict. Mem. Mus., Cat. No. 5666, plesiotype.

Orthoceras bullatum var. *pictoense* (Dawson). (Page 155.)

FIGURE 9. Showing surface and septa. Vict. Mem. Mus., Cat. No. 5662, lectotype.

Plate No. XXIV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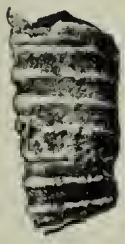
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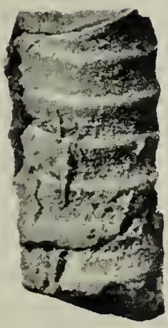
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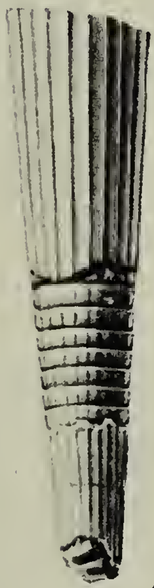
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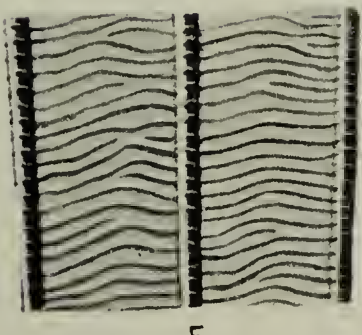
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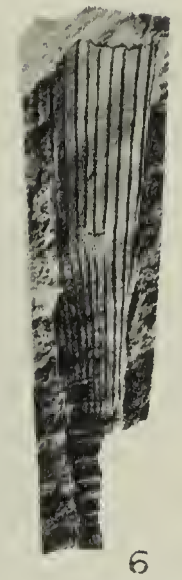
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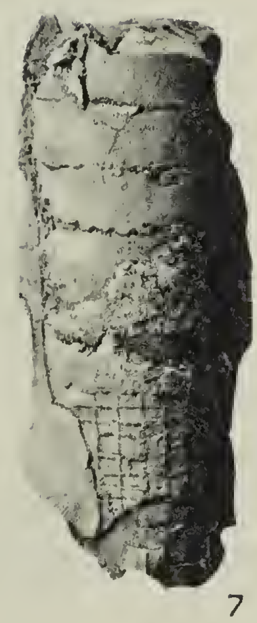
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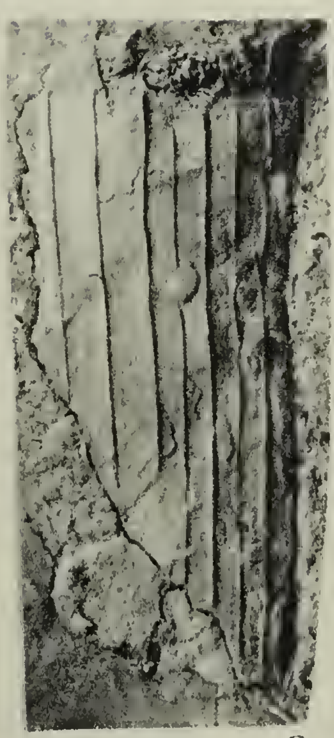
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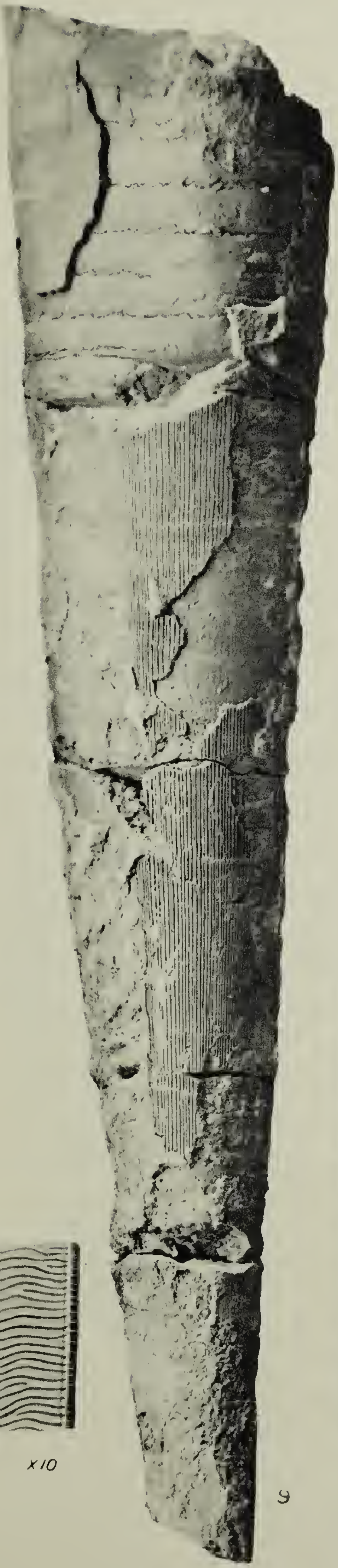
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PLATE XXV

Kionoceras angulatum (Wahlenberg). (Page 157.)

FIGURE 1. Vict. Mem. Mus., Cat. No. 5664, plesiotype.

Kionoceras latouri n. sp. (Page 158.)

FIGURE 2. Peabody Mus., Yale Univ., Cat. No. 469a, holotype. For enlargement of surface *See* Pl. XXIX, fig. 9.

Orthoceras antigonishense n. sp. (Page 152.)

FIGURE 3. Shows surface and septa. Vict. Mem. Mus., Cat. No. 5661, holotype.

Kionoceras angulatum var. *deflectostriatum* n. var. (Page 158.)

FIGURE 4. Peabody Mus., Yale Univ., Cat. No. 469b, holotype. For enlargement *See* Pl. XXIX, fig. 6.

Thoracoceras erro n. sp. (Page 159.)

FIGURE 5. Vict. Mem. Mus., Cat. No. 5581, paratype.
FIGURE 6. Vict. Mem. Mus., Cat. No. 5668, holotype.

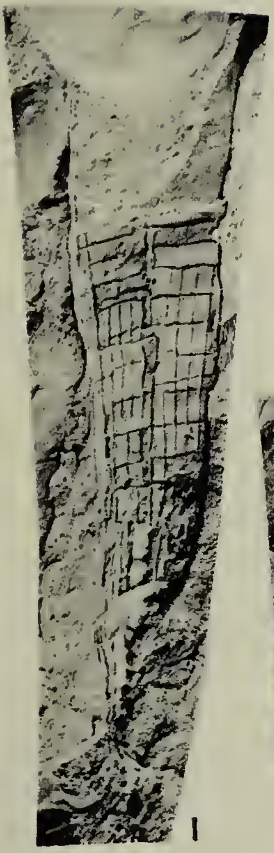
Kionoceras granosistriatum n. sp. (Page 159.)

FIGURE 7. Enlargement of surface in fig. 8. Vict. Mem. Mus., Cat. No. 5667, holotype.
FIGURE 8. Same specimen. Natural size.

Cyrtorizoceras breviradiatum n. sp. (Page 160.)

FIGURE 9. Proximal end. Vict. Mem. Mus., Cat. No. 5582, holotype.
FIGURE 10. Same specimen. Distal end.
FIGURE 11. Same specimen.

Plate No. XXV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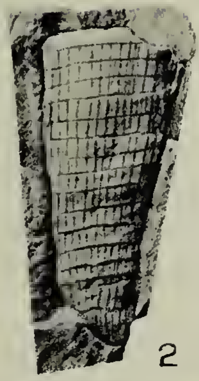
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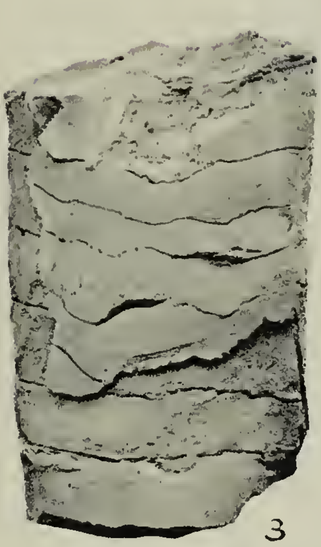
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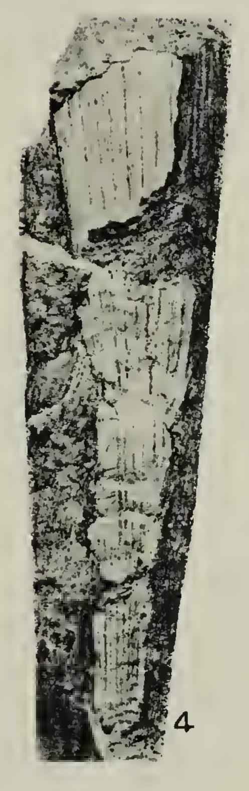
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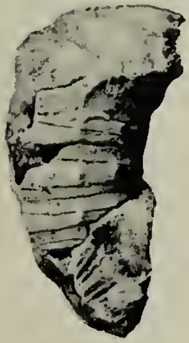
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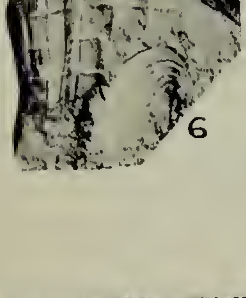
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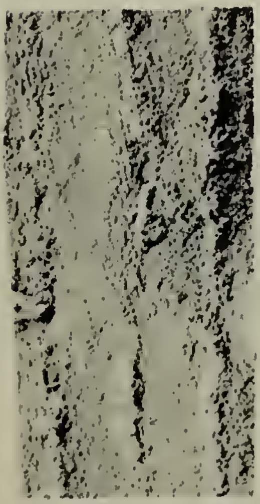
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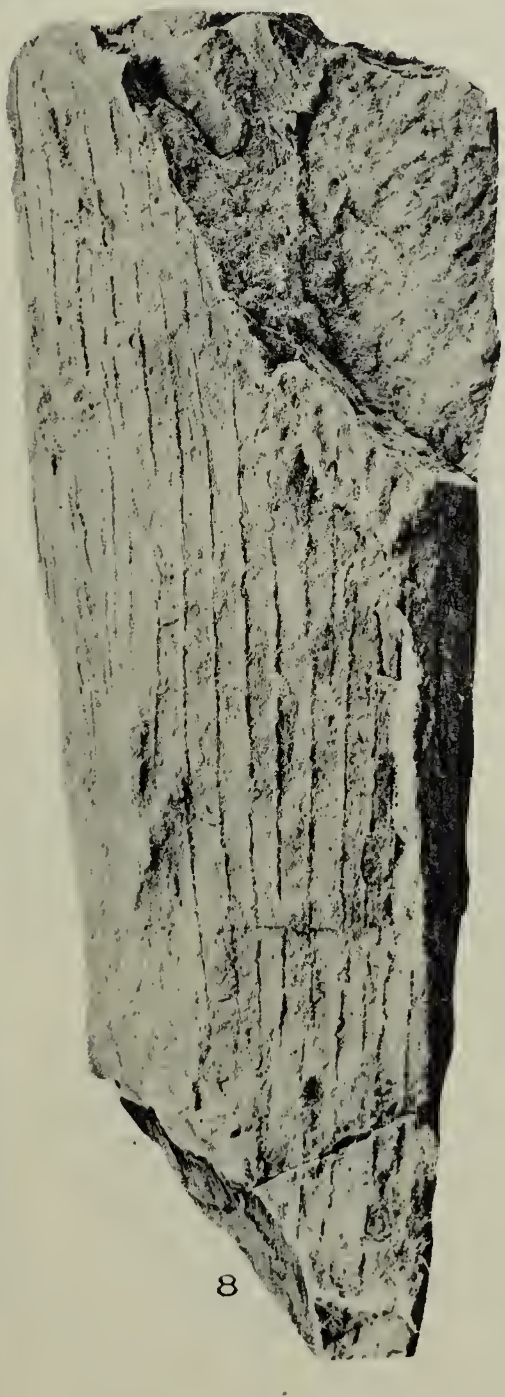
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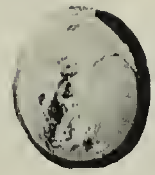
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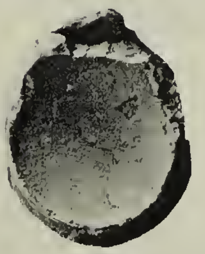
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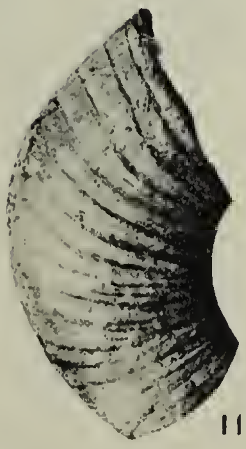
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PLATE XXVI

Calymene tuberculata (Brünnich). (Page 161.)

FIGURE 1. Vict. Mem. Mus., Cat. No. 5587, plesiotype.
FIGURE 2. Vict. Mem. Mus., Cat. No. 5584, plesiotype.

Calymene tuberculosa (Dalman). (Page 161.)

FIGURE 3. Vict. Mem. Mus., Cat. No. 5585, plesiotype.
FIGURE 4. Vict. Mem. Mus., Cat. No. 5586, plesiotype.

Calymene intermedia var. *antigonishensis* n. var. (Page 162.)

FIGURE 5. Pygidium. Peabody Mus., Yale Univ., Cat. No. 470, paratype.
FIGURE 6. Cephalon. Vict. Mem. Mus., Cat. No. 5588, paratype.
FIGURE 7. Hypostoma. Vict. Mem. Mus., Cat. No. 5590, paratype.
FIGURE 8. Hypostoma. Peabody Mus., Yale Univ., Cat. No. 470a, paratype.
FIGURE 9. Cephalon. Peabody Mus., Yale Univ., Cat. No. 470b, holotype.
FIGURE 10. Pygidium. Peabody Mus., Yale Univ., Cat. No. 470c, paratype.
FIGURE 11. Cephalon with high glabella. Vict. Mem. Mus., Cat. No. 5589, paratype.

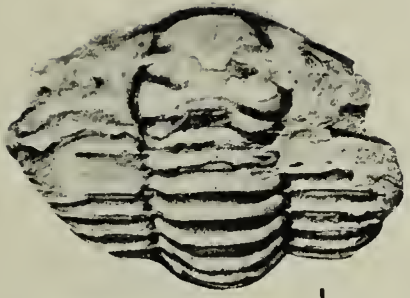
Homalonotus knighti Koenig. (Page 163.)

FIGURE 12. Side view of pygidium. Vict. Mem. Mus., Cat. No. 6209, plesiotype.
FIGURE 13. Same specimen.

Homalonotus dawsoni Hall. (Page 164.)

FIGURE 14. Pygidium. Side view. Peabody Mus., Yale Univ., Cat. No. 471, plesiotype.
FIGURE 15. Same specimen.

Plate No. XXVI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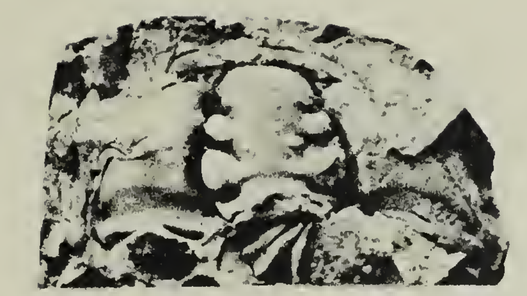
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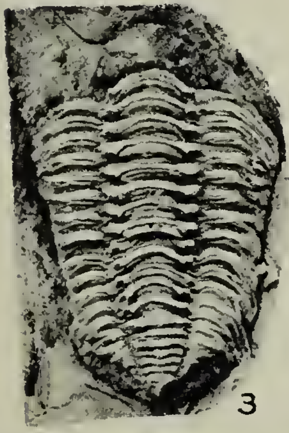
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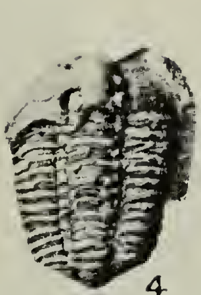
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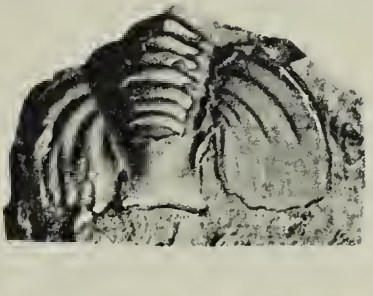
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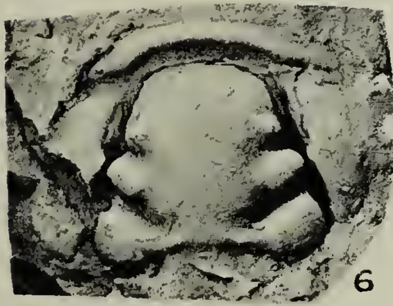
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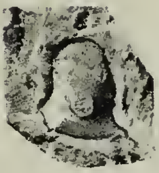
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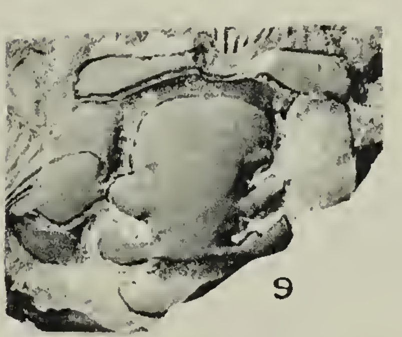
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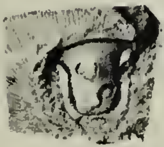
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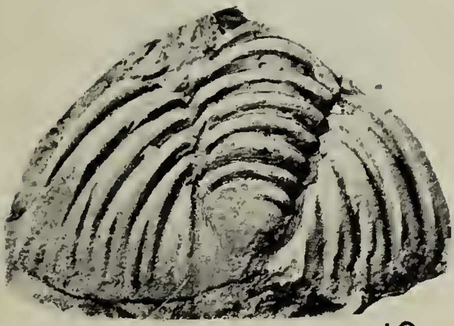
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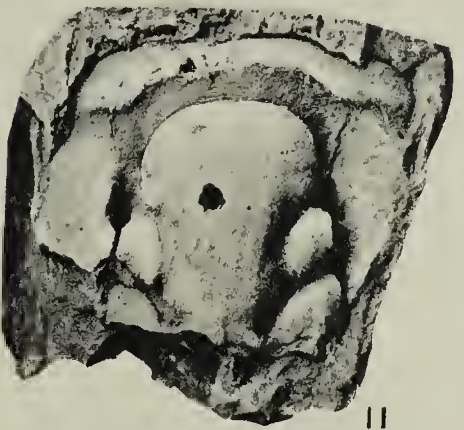
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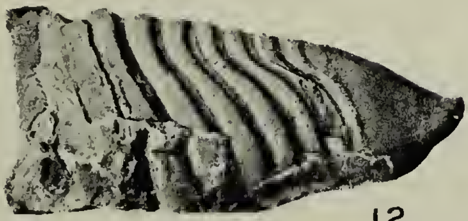
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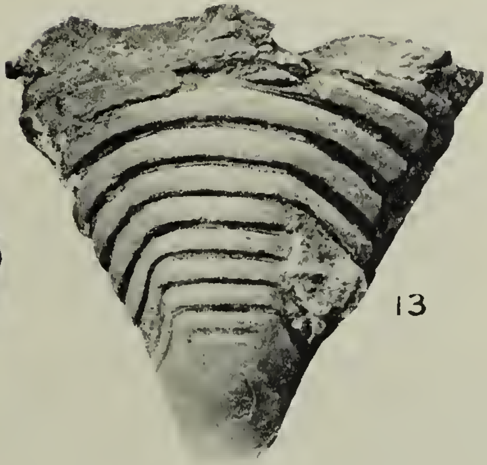
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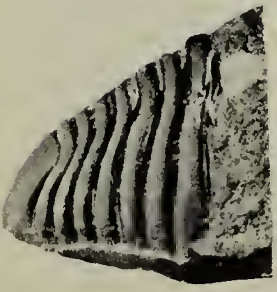
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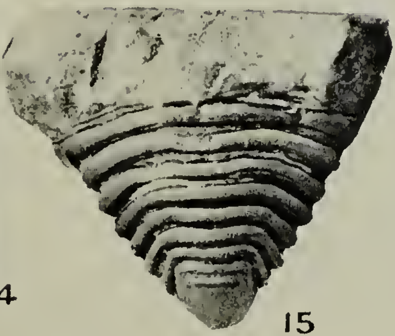
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PLATE XXVII

Dalmanitina logani var. *conservatrix* McLearn. (Page 168.)

FIGURE 1. Cephalon. Peabody Mus., Yale Univ., Cat. No. 472, holotype.
FIGURE 2. Cephalon approaching *D. logani*. Vict. Mem. Mus., Cat. No. 5999, paratype.

Dalmanitina logani (Hall). (Page 167.)

FIGURE 3. Cephalon approaching var. *conservatrix*. Vict. Mem. Mus., Cat. No. 6211, plesiotype.
FIGURE 4. Broad cephalon. Vict. Mem. Mus., Cat. No. 6210, plesiotype.
FIGURE 5. Pygidium. Vict. Mem. Mus., Cat. No. 5998, plesiotype.
FIGURE 6. Cephalon with narrow high glabella. Peabody Mus., Yale Univ., Cat. No. 480, plesiotype.

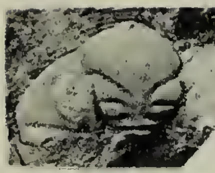
Dalmanites weaveri (Salter). (Page 169.)

FIGURE 7. Glabella of narrow form. Peabody Mus., Yale Univ., Cat. No. 473, plesiotype.
FIGURE 8. Pygidium. Peabody Mus., Yale Univ., Cat. No. 473a, plesiotype.
FIGURE 9. Form with broad cephalon. Peabody Mus., Yale Univ., Cat. No. 473b, plesiotype.
FIGURE 10. Pygidium. Peabody Mus., Yale Univ., Cat. No. 473c, plesiotype.

Homalonotus dawsoni Hall. (Page 164.)

FIGURE 11. Dorsal view. Peabody Mus., Yale Univ., Cat. No. 474, plesiotype.
FIGURE 12. Same specimen. Side view.
FIGURE 13. Side view. Peabody Mus., Yale Univ., Cat. No. 474a, plesiotype.
FIGURE 14. Same specimen. Anterior view.
FIGURE 15. Same specimen. Dorsal view.
FIGURE 16. Cephalon of large specimen. Peabody Mus., Yale Univ., Cat. No. 474b, plesiotype

Plate No. XXVII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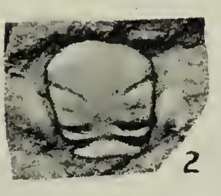
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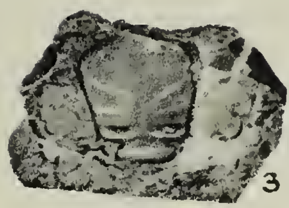
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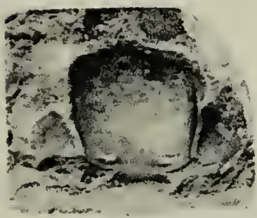
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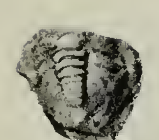
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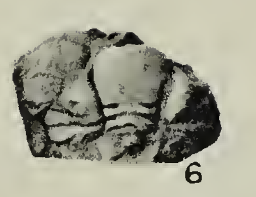
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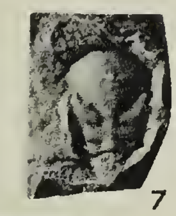
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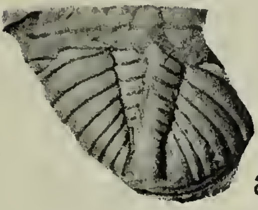
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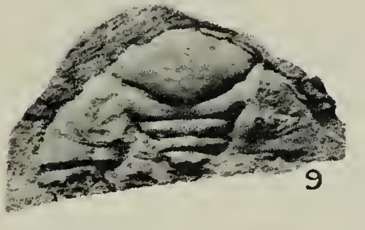
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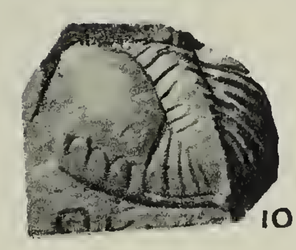
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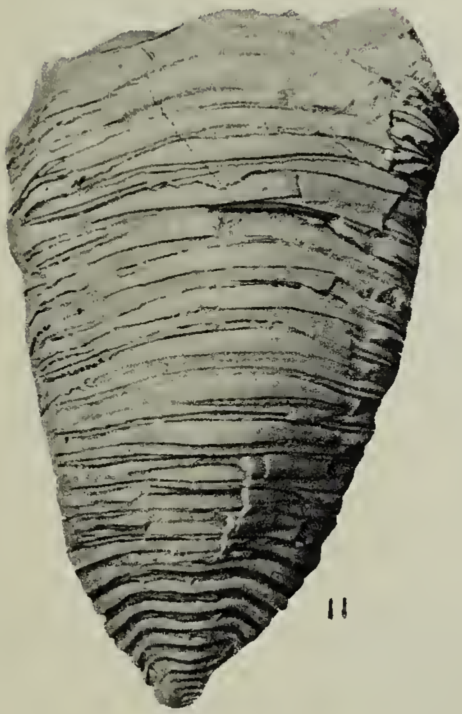
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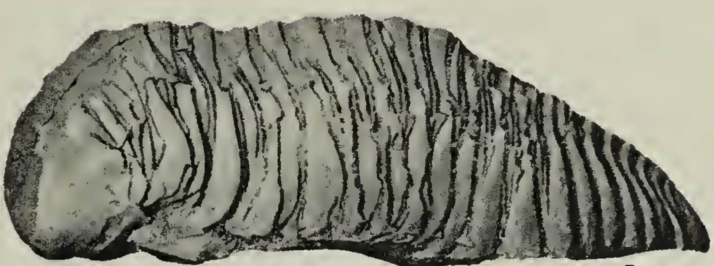
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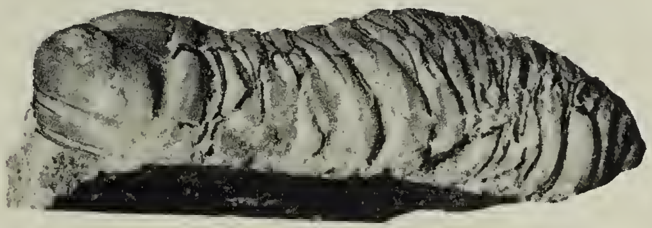
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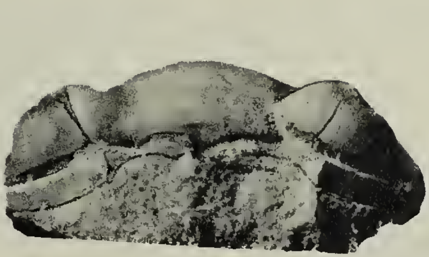
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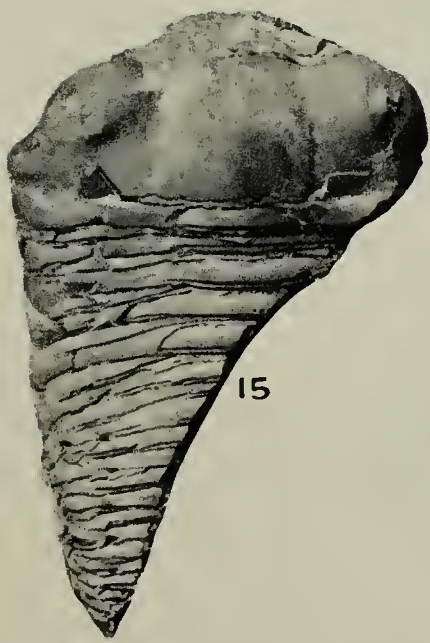
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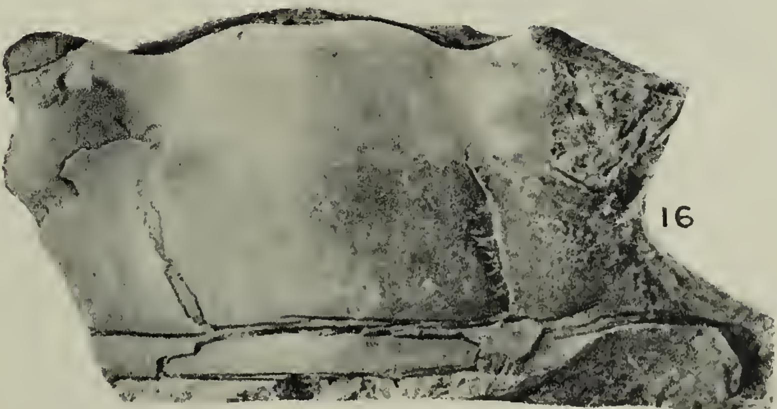
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Plate XXVIII

Phacops (*Portlockia*) *marklandensis* McLearn. (Page 171.)

Figure 1. Cephalon and thorax. Vict. Mem. Mus., Cat. No. 6001, paratype.

Figure 2. Coiled specimen. Pygidium and part of thorax. Peabody Mus., Yale Univ., Cat. No. 483, holotype.

Figure 3. Same specimen. Cephalon and part of thorax.

Figure 4. Same specimen. Side view.

Dalmanites sp. (Page 170.)

Figure 5. Pygidium. Peabody Mus., Yale Univ., Cat. No. 482.

Lingula taeniola Hall and Clarke. (Page 45.)

Figure 6. X 2. Peabody Mus., Yale Univ., Cat. No. 475, plesiotype.

Camarotoechia squamifera n. sp. (Page 71.)

Figure 7. Surface X 2. Peabody Mus., Yale Univ., Cat. No. 476, paratype.

Pteronitella curta Billings. (Page 121.)

Figure 8. Left valve. Vict. Mem. Mus., Cat. No. 3135a, holotype.

Conularia twenhofeli n. sp. (Page 37.)

Figure 9. Surface of spec., Pl. I, fig. 16, enlarged X 4.

Idiorthis matura n. sp. (Page 57.)

Figure 10. Surface striation X 3 of spec. Pl. III, fig. 22.

Plagiorhyncha plastica n. sp. (Page 78.)

Figure 11. Surface striation X 2 of specimen, Pl. VIII, fig. 7.

Brachyprion mertoni n. sp. (Page 61.)

Figure 12. Spec., Pl. IV, fig. 17, enlarged X 2. Lateral ridges bordering muscle scars should diverge at a slightly higher angle.

Nuculites cawdori var. *erectus* (Hall). (Page 106.)

Figure 13. Drawing of spec., Pl. XIII, fig. 12, enlarged X 2.

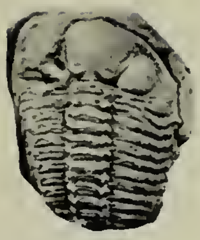
Nuculites concentricus var. *subovatus* (Hall). (Page 102.)

Figure 14. Drawing of spec., Pl. XIII, fig. 30, to show surface striation, escutcheon, and teeth. Anterior end is too pointed.

Kionoceras angulatum (Wahlenberg). (Page 157.)

Figure 15. Enlargement X 3 of surface of inner layer of spec., Pl. XXIV, fig. 7.

Plate No. XXVIII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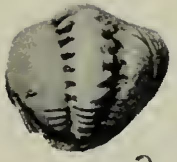
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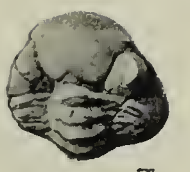
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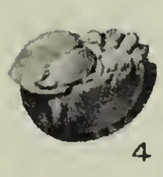
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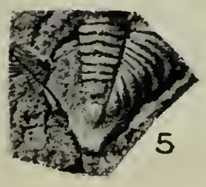
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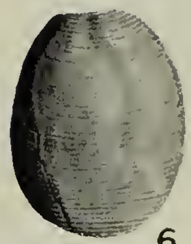
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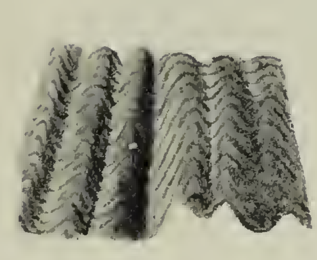
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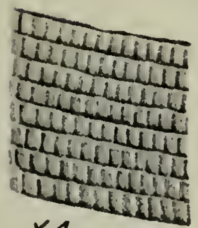
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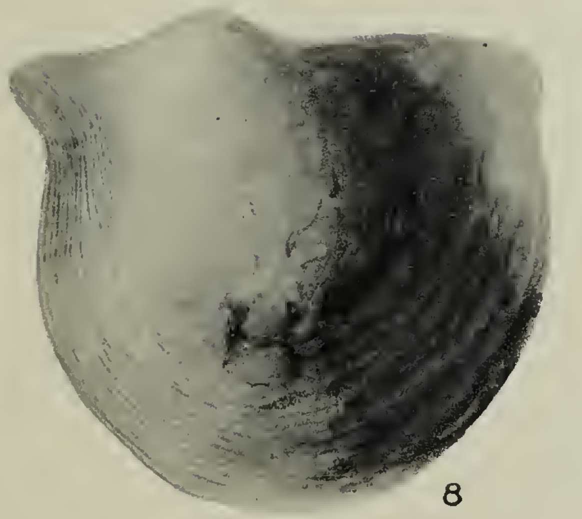
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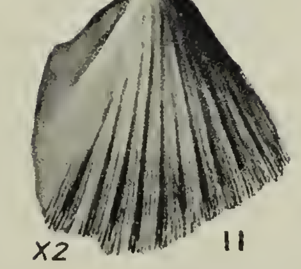
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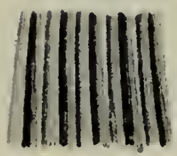
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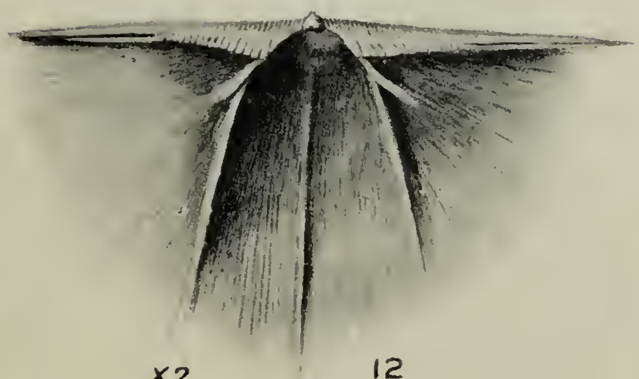
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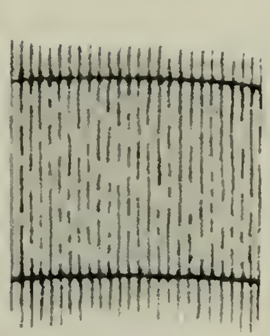
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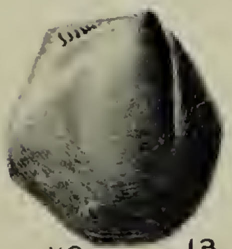
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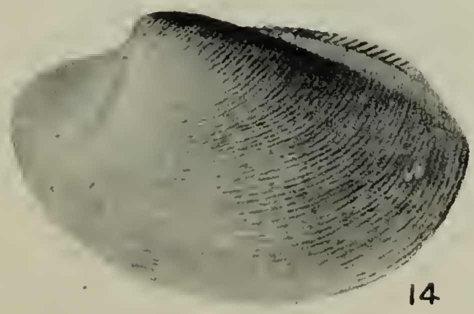
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PLATE XXIX

Pectorhyncha antiqua n. sp. (Page 72.)

FIGURE 1. Enlargement of spec., Pl. VII, fig. 12; shows dental plates cemented to walls of valve.

Plagiorhyncha glassi (Davidson). (Page 79.)

FIGURE 2. Interior ventral valve. Note position of dental plates. Vict. Mem. Mus., Cat. No. 5441b, plesioplastotype.

Pectorhyncha obtusiplicata (Hall). (Page 73.)

FIGURE 3. Enlargement of spec., Pl. VII, fig. 13. Interior ventral valve. Note tooth on wall of valve, due to fact that dental plates cemented to valve wall.

Kionoceras angulatum (Wahlenberg). (Page 157.)

FIGURE 4. Enlargement of surface of spec., Pl. XXIV, fig. 6.

Pectorhyncha antiqua n. sp. (Page 72.)

FIGURE 5. Enlargement of spec., Pl. VII, fig. 6. Interior dorsal valve. Note *Camarotoechia* character.

Kionoceras angulatum var. *deflectostriatum* n. var. (Page 158.)

FIGURE 6. Enlargement surface of spec., Pl. XXV, fig. 4.

Dawsonoceras elegantulum (Dawson). (Page 156.)

FIGURE 7. Enlargement of part of spec., Pl. XXIV, fig. 1; shows surface striatum and septa. Slope of annulations too great.

Goniophora transiens Billings. (Page 131.)

FIGURE 8. Drawing of spec., Pl. XVIII, fig. 7.

Kionoceras latouri n. sp. (Page 158.)

FIGURE 9. Enlargement of surface of Pl. XXV, fig. 2. Shows longitudinal striation and septa.

Goniophora consimilis Billings. (Page 129.)

FIGURE 10. Drawing of spec., Pl. XVIII, figs. 2, 3. Shows surface sculpture.

Nuculites concentricus (Hall). (Page 101.)

FIGURE 11. Drawing of spec., Pl. XII, fig. 18; shows surface striatum, escutcheon, and hinge teeth.

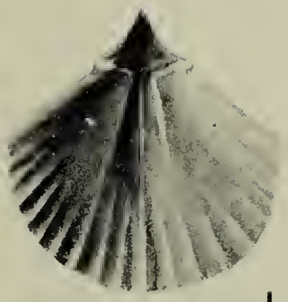
Orthoceras punctostriatum Hall. (Page 153.)

FIGURE 12. Enlargement of surface of inner layer of spec., Pl. XXII, fig. 9.

Goniophora mediocris Billings. (Page 130.)

FIGURE 13. Drawing of spec., Pl. XVIII, figs. 4, 5.

Plate No. XXIX



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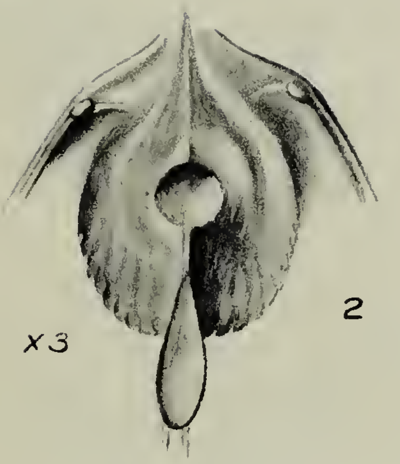

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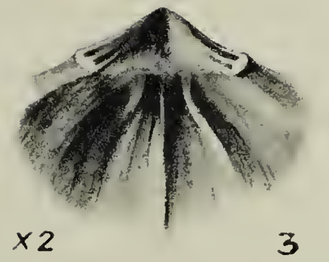

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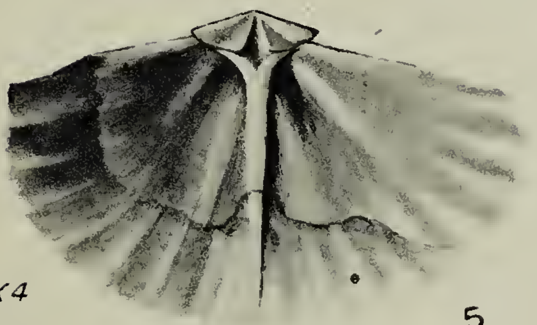

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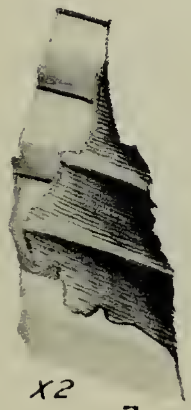

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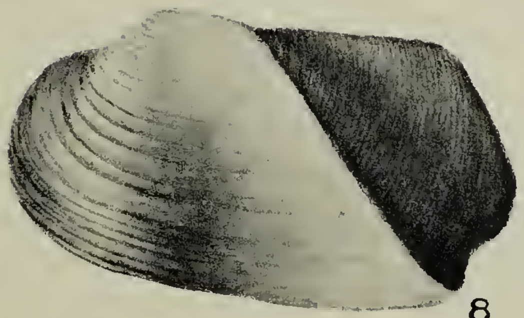
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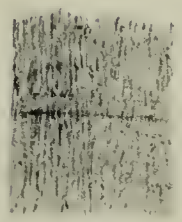

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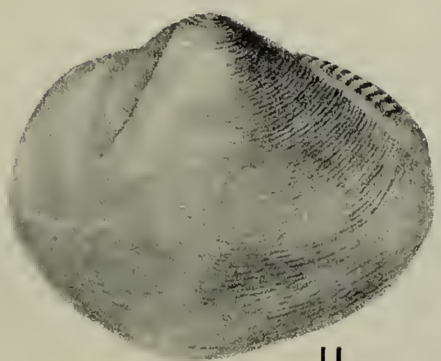
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PLATE XXX

Eatonioides lamellornatus McLearn. (Page 75.)

FIGURE 1. Enlargement of part of surface of spec., Pl. VII, fig. 22. Shows surface scuplture.

Nuculites concentricus var. *subovatus* (Hall). (Page 102.)

FIGURE 2. Drawing of spec., Pl. XII, figs. 16, 17. Note escutcheon and surface striation. View from above.

FIGURE 3. Same specimen from side. Note escutcheon and surface striation.

Eatonioides westoni n. sp. (Page 74.)

FIGURE 4. Enlargement of part of spec., Pl. VII, fig. 17. Note crura, crural cavity, and stout median septum of dorsal valve.

Pectorhyncha obtusiplicata (Hall). (Page 73.)

FIGURE 5. Enlarged drawing (X 6) of part of spec., Pl. VII, fig. 15, showing crura of dorsal valve. *See also* this Plate, fig. 8.

Nuculites cawdori mut. *rossonia* n. mut. (Page 104.)

FIGURE 6. Enlarged drawing of spec., Pl. XIII, fig. 5.

Eatonioides westoni n. sp. (Page 74.)

FIGURE 7. Enlargement of spec., Pl. VII, fig. 16. Note large, well-excavated muscle scars, bounded by a ridge. Ventral valve.

Pectorhyncha obtusiplicata (Hall). (Page 73.)

FIGURE 8. Enlargement X 4 of spec., Pl. VII, fig. 15. Note median septum, crura, and crural cavity. Dorsal valve. *See also* this Pl., fig. 5.

Camarotoechia bimesiornata n. sp. (Page 69.)

FIGURE 9. Interior ventral valve X 2. Note dental plates, extending from walls of interior of beak out into the valve. Cast of spec., Pl. V, fig. 5. Vict. Mem. Mus., Cat. No. 5427a, paraplastotype.

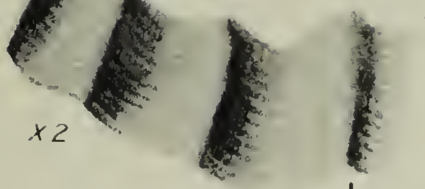
Tropinuculites carinatus (Hall). (Page 110.)

FIGURE 10. Enlarged drawing of spec., Pl. XIV, fig. 20. Does not show escutcheon.

Nuculites concentricus var. *subovatus* (Hall). (Page 102.)

FIGURE 11. Drawing of spec., Pl. XIII, fig. 28. Note escutcheon and surface striation. Anterior end as drawn is too pointed.

Plate No. XXX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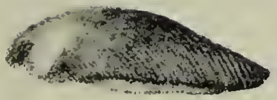
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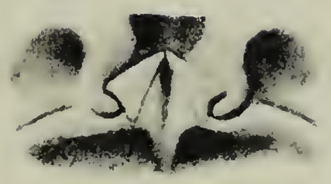
x6 5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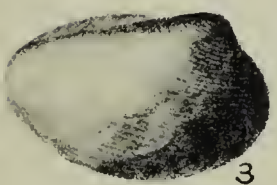
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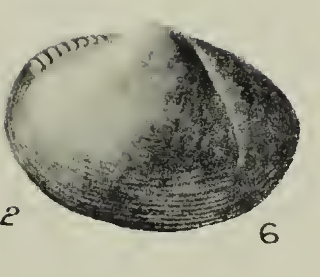
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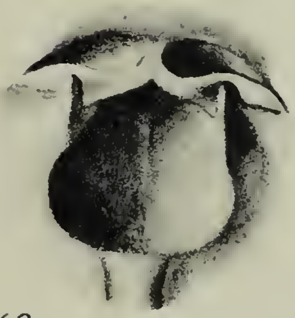
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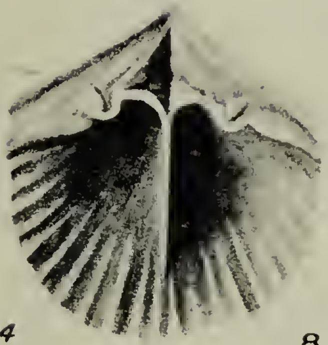
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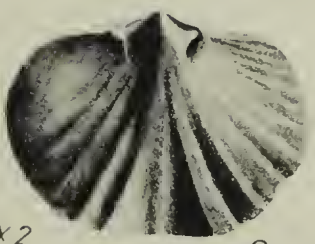
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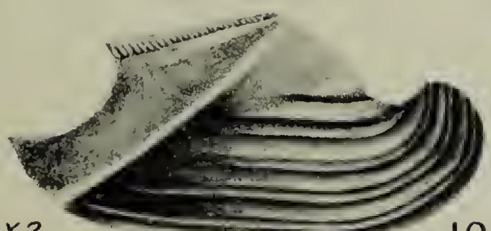
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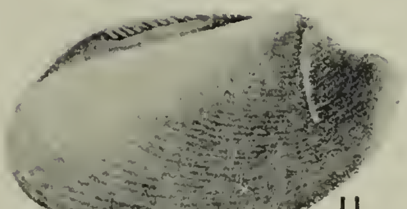
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